Southern Power & Industry

The Industrial and Power Journal of the South Southwest

University Microfilms Inc
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NOVEMBER, 1960

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SPI . . . 57th Year

REACHES industrial plants (manufacturing, process, utility and large service) in the South & Southwest.

SERVES plant managers, superintendents, engineering department heads and plant operating staffs.

PROVIDES information to solve design, installation, operating and plant maintenance problems.

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Closeup of Grinnell Variable Spring Hanger supporting boiler feed pipe.

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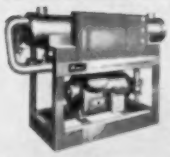
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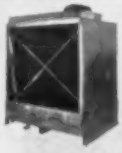
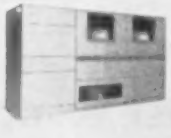
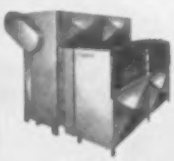

Cooling Towers
3-120 tons


Packaged Air Conditioners
3-60 tons

Evaporative Condensers
10-110 tons


Air Handlers
665-47,000 cfm

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Volume 78 Number 11

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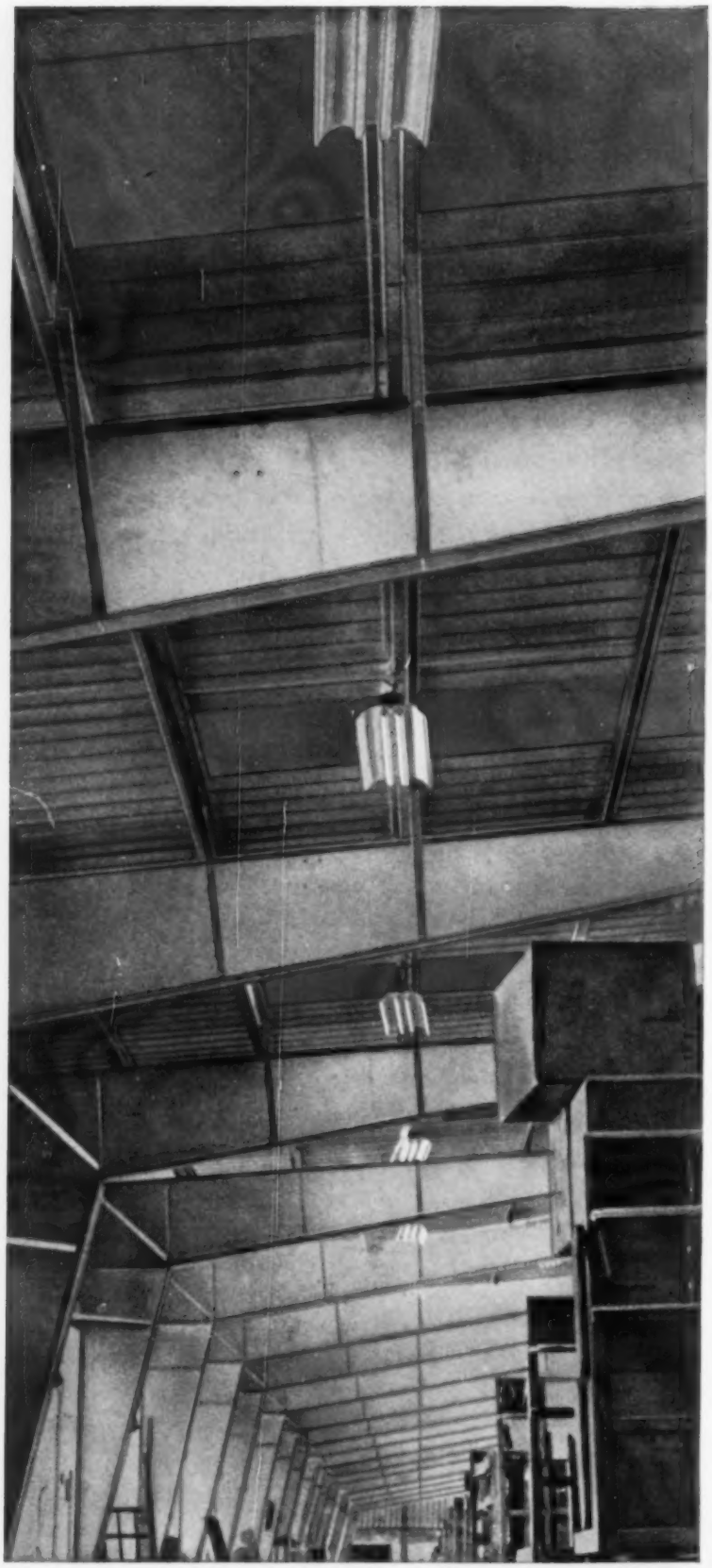

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SPI Facts and Trends

November, 1960

◆ OLDER EMPLOYEES — Workers in the 45 to 65 age bracket are finding jobs more easily than they did several years ago, said the National Association of Manufacturers in a special report on "Employment of Mature Workers."

Employer acceptance of older workers has been found to be increasing, and pension plan difficulties have been resolved or discovered to be of less importance than once believed. Employers increasingly are realizing that the worker between 45 and 65 is frequently in his best years because of knowledge and judgment gained through his experience. The development of machinery to replace strenuous physical effort has made possible the retention and hiring of older workers in jobs that would have been beyond their strength a few years ago.

◆ ALUMINUM BUSES — A group of enormous aluminum tubes have been fabricated by the Delta Star Electric Division of H. K. Porter Company, into what are believed to be the world's largest electrical buses.

For use as "generator leads" or "station bus" (to carry electrical energy from a turbine generator into the switchyard of a power plant), the buses are 19 and 20.5 inches in diameter, with five-eighths-inch walls. They are rated 10,000 to 11,500 amperes for operation at voltages of 12.6 to 16.5 kv.

◆ BETTER RUBBER — Natural rubber latex can be custom tailored for a wide variety of finished products by exposing it to radiation at the plantation level, a Goodyear Tire & Rubber Company research team reports.

By varying the radiation dose, the molecular structure of the latex can be changed at will. Although results depicted in the report are based on preserved, concentrated latex, it is reasonable to assume that comparable data would be obtained using fresh natural latex. This would permit irradiation to be done at the plantation site.

◆ SKY HOOK — Old time pipe liners — with their pranks and jokes about "sky hooks" — never dreamed of "whirlybirds."

Last month in United Gas Pipe Line Company's Jackson district, essential repair to a high pressure 30-inch natural gas transmission line, which would have required several days without the help of a 'copter, was accomplished in a matter of hours. The break was in a "walk and wade" section of swamp.

◆ HOT SHOT — Temperatures as hot as the surface of the sun, and space age speeds up to 20,000 miles per hour, are now being created in a $1,000,000 "hot shot" wind tunnel recently built by McDonnell Aircraft Corporation in St. Louis.

Key structural components of the new Hypervelocity Impulse Tunnel were fabricated from VascoJet 1000, an ultra-high strength steel developed and manufactured by Vanadium-Alloys Steel Company. The tunnel creates test conditions with speeds from 10 to 27 Mach at temperatures up to 14,000 F and pressures as great as 100,000 psi.

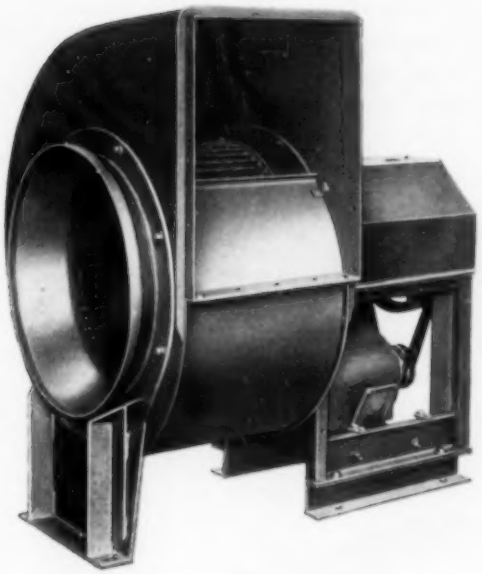
(Continued on Page 9)

CLARAGE

New line of

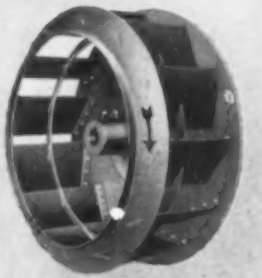
V-belt driven

Ready Units



LS Ready Units have Low Speed, forward curved blade wheels. These are of the long-recognized Clarage Type HV multiblade design.

or



MS Ready Units have Medium Speed, backward inclined blade wheels with non-overloading horsepower characteristic. These are of the highly regarded Clarage Type NH, Class I design.

Exceptionally sturdy, quiet, ready-to-run fan sets

- for volumes up to 25,000 CFM
- for static pressures thru 2½"
- for clean air up to 300° F.

Distinguishing points — over 15 of them — make these new Clarage units outstanding.
To mention a few: Better motor ventilation . . . entire drive within frame of unit . . . complete accessibility to motor, drive, and bearings. Learn more about the numerous specific advantages that mean greater value to you from Clarage. Request Catalog 517 . . . 36 pages of complete information, selector charts, capacity tables, dimensions. Clarage Ready Units are ideally suited for supply or exhaust jobs — indoors or outdoors — for buildings of all types, all sizes.

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BJ Quality does cost less in the long run!

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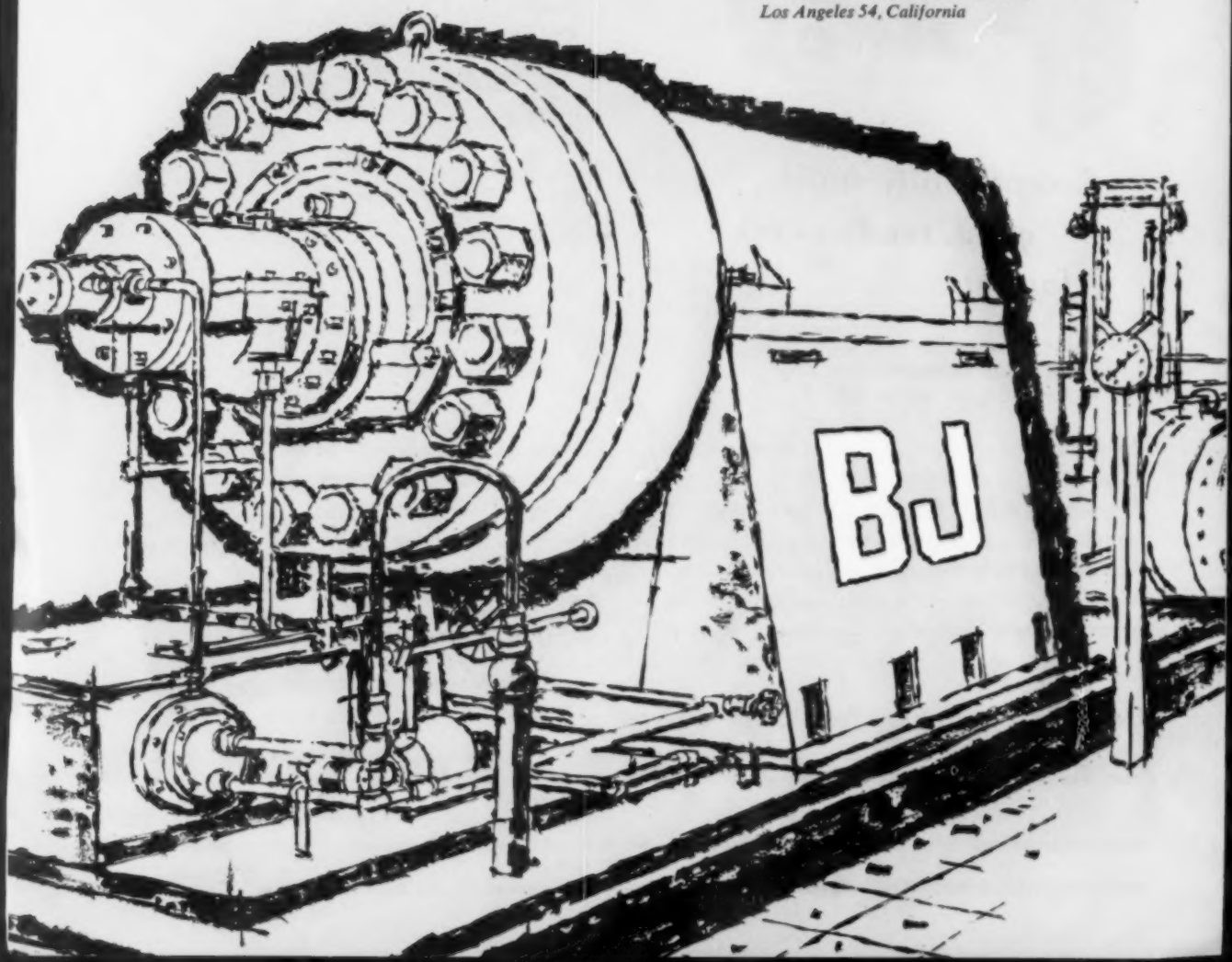

Facts and Trends (Continued)

◆ SYNTHETIC RUBBER — The "leaps and bounds" progress in the development of man-made rubber is evidenced at the world's largest synthetic rubber plant in Houston. When Goodyear acquired ownership in 1955, only four types of synthetic rubber were produced. Today, 11 different types are in production, including only two of the original four. The development of new synthetics at the rate of nearly two a year reflects the competitive nature of the industry and the trend to produce tailor-made materials for specific uses, Goodyear officials said.

◆ ULTRASONIC WELDING — The American Welding Society announces the publication of a new booklet, Ultrasonic Welding, containing 38 pages and 29 illustrations, to meet the growing demand for technical literature on new developments in the welding industry.

The ultrasonic process is regarded by some as having the greatest potential for future development. Many similar and dissimilar metals which were previously considered unweldable can be welded by this process. High frequency vibratory energy produces a sound metallurgical bond without arc or spark, melting of the base metals, or deformation of the materials being welded. Copies, at $1.50 each, may be obtained from the American Welding Society, 33 West 39th St., New York 18, N. Y.

◆ ALUMINUM SPOT WELDING — Refinements developed by Olin Mathieson Chemical Corp. during a two-year study program will now make the MIG arc spot welding process much more useful to many aluminum fabricators.

MIG spot welding, called "metallurgical riveting" by some technicians, was first developed by welding equipment manufacturers for use in joining steel. It has not heretofore been widely used for aluminum because of difficulties in obtaining consistent results. It is a form of consumable electrode, inert gas shielded, metal arc welding (MIG: metal, inert gas). The welds are made from one side of the joint, leaving the other side smooth.

◆ PRICES REDUCED — Westinghouse Electric Corporation's power circuit breaker department reduces catalog prices effective immediately, from 8 to 39 per cent on floor-mounted, oil-filled power circuit breakers; 20 to 50 per cent on frame-mounted breakers; and 26 to 47 per cent on single-tank distribution breakers. Indoor oil breakers are not affected.

In addition, prices are being published for the first time covering available ratings of the new SF_6 gas breakers. These prices are higher than newly published oil breaker prices.

◆ PROFESSIONAL ENGINEER — Paul H. Robbins, executive director of the National Society of Professional Engineers, has termed the rejection of the Engineers Association, I.U.E., AFL-CIO, by engineering personnel at Sperry Gyroscope Company as "welcome confirmation of the trend among engineers to look toward professional means to serve their interests."

The director of the 52,000-member engineering group emphasized that the Society's program "has always stressed the joint and mutual responsibility of engineers and management in the field of professional employment practices. The Society will do all it can to assist the engineers and the company in making the vote truly meaningful in terms of future advancement through professional concepts."

(Continued on Page 10)

Facts and Trends (Continued)

◆ SUPER-GRAPHITES — One of the most promising high temperature rocket materials ever developed has been revealed by the disclosure of a series of high-density super-graphites being produced by National Carbon Company.

In a revolutionary hot-working process more akin to metallurgical than ceramic technology, a recrystallized graphite is produced with approximately two to three times the high temperature strength of conventional graphites. This unique material has usable strength at temperatures as high as 5500 F. It is the crystal alignment and internal grain structure of the recrystallized graphite that provide both high strength and low creep rate. The material retains the advantages of machinability and thermal shock resistance, while attaining strengths and densities comparable to pyrolytic graphite.

◆ RURAL LIGHTNING HAZARDS — The Lightning Protection Institute made a two-year study of lightning losses across the country and determined that the movement to outlying country areas is largely responsible for an increase in lightning losses of about 50 per cent in the past 12 years.

New buildings in the open country become lightning targets because (1) they are isolated, and (2) they are the highest objects in the area in which positive electrical ground charges congregate to be as close as possible to their negative opposites contained in storm clouds. Deprived of the cone of protection usually offered in part by skyscrapers and other tall city buildings, suburban plants are vulnerable to more frequent lightning strikes.

◆ EXPLOSIONS SUPPRESSED —Engineers of Fenwal Incorporated recently demonstrated a unique, patented system said to detect an explosion at the instant of its inception, and within a few thousandths of a second to literally snuff out the blast before it can become destructive.

Although a blast appears to be instantaneous, there is a finite lapse in time between its ignition and the build-up of destructive pressures. The protection system acts within this period. In a few milliseconds the system detects the very beginning of the explosion, either by sensing the initial pressure build-up or the first tiny flame, and automatically reacts to snuff it out. The blast is made harmless by a combination of actions, which may include any of the following: suppression, venting, advance inerting, isolation and equipment shut down.

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HOW EPOXY CAN SERVE YOU—4 pages. Tells exactly how 10 separate repair jobs were handled and describes several epoxy mixes that are good for maintenance jobs.

ORIFICE METER INSTALLATIONS—Tells what the plant man needs to know about installation to get accurate, dependable service.

INSPECTION REPORTS—Tells how the station chemist can maintain information on the condition of boilers, cooling towers, condensers, heat exchangers, tanks and softeners. Actual inspection sheets are presented.

Write the editors for additional information on any of the above items. SOUTHERN POWER & INDUSTRY. 806 Peachtree St., N.E. Atlanta 8, Ga.

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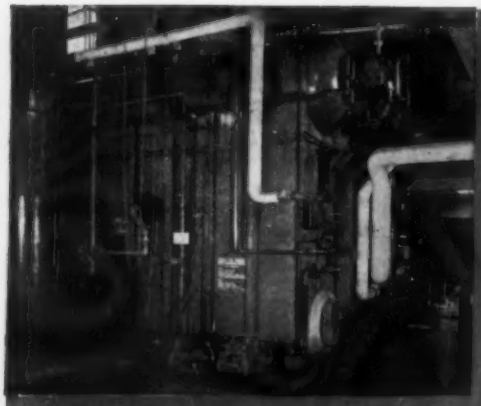

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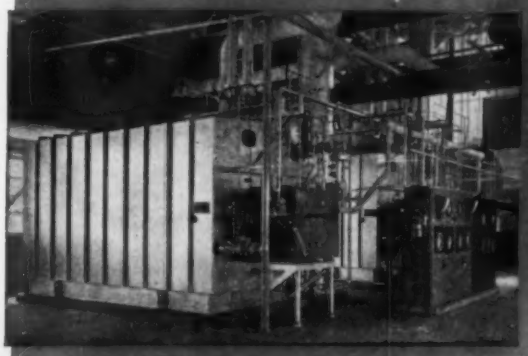
Placed on a suitable foundation, only fuel, water, breeching and steam connections need to be made to place unit in operation. Vogt Package boilers are available in oil and/or gas fired types in standard pressures of 175, 250 and 375 pounds per square inch gage.

One of two 30,000 lbs/hr units for a hospital



Two 25,000 lbs/hr units installed in a manufacturing plant

This 18,000 lbs/hr unit is one of two for an office building

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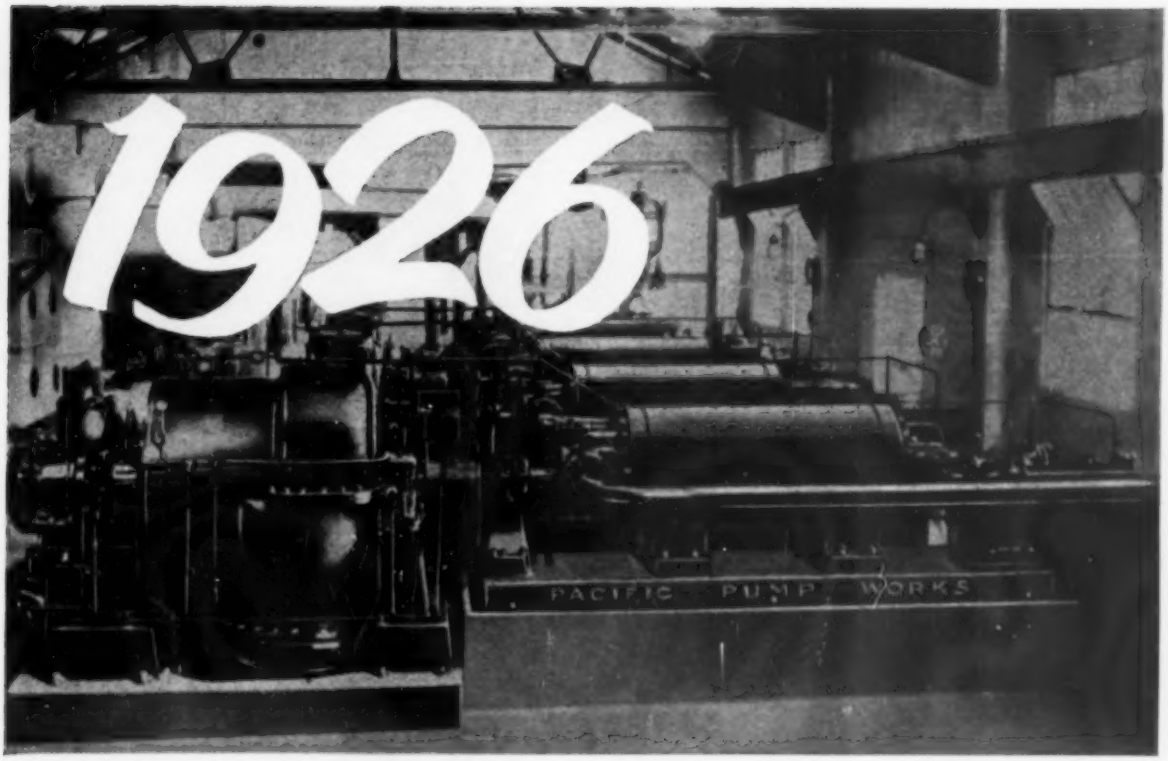


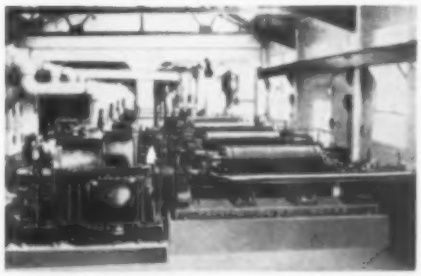
PACIFIC PUMPS

first "FIRST"

The centrifugal pumps designed and built for Pan American Oil Company's new high-pressure cracking process in 1926 was one of the most significant engineering achievements of the Twenties in the refinery processing field. The first of many Pacific Pumps' "FIRSTS", this particular pump was the forerunner of today's greatly improved Pacific centrifugal process pump line. Over the years Pacific has built and installed thousands of vertical and horizontal centrifugal pumps for extreme pressures and temperatures demanded by the petroleum, chemical, petro-chemical and allied industries. In addition, Pacific designs and manufactures boiler feed pumps for the power industry, steam turbo-pumps for the marine and power generation fields, and plunger pumps for oil-well service.

This first Pacific advertisement appeared in several petroleum publications early in 1927

2000 POUNDS PRESSURE WITH CENTRIFUGAL PUMPS



View of recent installation of four "PACIFIC" Multi-stage Pumps at Pan American Petroleum Company Refinery, Los Angeles. Each Pump delivers a capacity of 400 Gallons Per Minute of Oil against a pressure of 2000 pounds. Pumps are driven by 750 H. P. Steam Turbines. Each Pump weighs nine tons and was required to pass a hydrostatic test of 5000 pounds pressure.

We are prepared to make prompt shipment of Booster Pumps for Pipe Line or High Pressure service. Special Pumps designed for unusual conditions.

PACIFIC PUMP WORKS

350 Bicket Street Huntington Park Los Angeles, Cal.

Write for **Bulletin 1C**

PACIFIC

Offices in all Principal Cities

PACIFIC PUMPS

Inc. . . A Division of Dresser Industries, Inc.

HUNTINGTON PARK, CALIFORNIA

IN-1

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Coal Traffic Manager—Tidewater
Terminal Bldg., Norfolk, Virginia
Telephone MAdison 7-7481
Extension 131

LAWRENCE T. FORBES
District Manager, Coal Traffic
Raleigh County Bank Bldg.
Beckley, W. Va.
Telephone CLifford 2-6421

ROY L. JOHNSON
District Manager, Coal Traffic
833 Chamber of Commerce Bldg.
Boston 10, Mass.
Telephone LIberty 2-2229

ALVIN JOHNSON
District Manager, Coal Traffic
660 Marquette Bldg., 140 S. Dearborn St.
Chicago 3, Ill.
Telephone RAndolph 6-4634

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District Manager, Coal Traffic
General Office Bldg.
Roanoke, Va.
Telephone Diamond 4-1451
Extension 423

WILLIAM H. HUNTON
Asst. District Manager, Coal Traffic
2059 Railway Exchange Bldg.
St. Louis 3, Mo.
Telephone MAin 1-1180

MARTIN T. DELABAR
District Manager, Coal Traffic
1105 Reynolds Bldg.
Telephone PArk 2-7116
Winston-Salem 1, N. C.

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District Manager, Coal Traffic
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Telephone DUnbar 1-1325

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FIGHT FOR EFFICIENCY

What's the most important job of these 11 Norfolk and Western coal traffic men? Helping you achieve lowest cost per 1,000 pounds of steam! They'll analyze your combustion needs — recommend the coals that most exactly fit your needs and your equipment — suggest changes in methods or equipment to increase your efficiency. Coal's their career and "service," their creed! Let them help you make the most economical use of the nation's most economical fuel!

These N&W coal traffic men are at your service around the clock and through the calendar. Sound, reliable, conscientious, they may double your efficiency but never their talk! Call them . . . any time!

N&W

NORFOLK & WESTERN RAILWAY

General Offices, Roanoke, Virginia

For more information, Use Reply Card—Page 85

the SOUTH—SOUTHWEST

more power . . . more plants . . . more money

Rust Engineering Builds N. C. Paper Mill Addn.

The Rust Engineering Company of Pittsburgh, Pa., and Birmingham, Alabama, was awarded a contract by **Halifax Paper Company, Inc.,** Roanoke Rapids, North Carolina, division of Albemarle Paper Manufacturing Company, Richmond, Virginia, for additional pulp mill facilities costing about $1,750,000. Design and engineering will begin immediately in the Birmingham office of Rust, with construction starting in several months.

The new facilities will increase the total rated pulp production capacity of the Halifax Paper plant from its present 740 tons to 800 tons per day. Also the facilities, for the first time, will permit the simultaneous pulping of hardwood and pine.

Plant additions will consist of two new digesters, pulp washer, a lime kiln and certain other auxiliary equipment.

In 1959 Rust completed construction on paper mill improvements in a $6,000,000 project, which included a new 246" paper machine to produce 350 tons of Kraft daily at this same location.

Florida Reactor Project

A research and development program related to the proposed gas-cooled prototype nuclear power plant of the **East Central Nuclear Group** and **Florida West Coast Nuclear Group** has been reoriented toward the early development of beryllium-clad fuel elements.

The objective of the reoriented research and development program is to resolve the technical problems involved in the use of beryllium as cladding for fuel elements before a decision is made to construct the prototype plant. Previous research emphasized development of fuel elements clad with stainless steel for the first core loading. The major advantage of the gas-cooled, heavy water-moderated reactor concept is its ability to operate on natural uranium which requires the use of beryllium or other low neutron-absorbing cladding material. The new research program is expected to delay completion of the plant, originally scheduled for July 1963, by from one to two years.

The Industrial Brownhoist bulk unloader leaves the Main Yard of Avondale Shipyards by barge, destined for installation at the Port of New Orleans.

Port of New Orleans Installs Unloader

A bulk unloader, designed by the **Industrial Brownhoist Corporation** and fabricated and installed by **Avondale Shipyards, Inc.,** has been added to the rapidly expanding facilities of the Port of New Orleans.

The unit, measuring 30 feet by 46 feet at its base and having an overall height of approximately 150 feet, is capable of handling 90 tons of ore per hour. It is the first public ore unloading facility on the Mississippi River—Gulf Outlet.

Reynolds Expansion — Va.

A major expansion of **Reynolds Metals Company's** Bellwood Extrusion Plant in suburban Chesterfield County, to include installation of the world's largest self-contained aluminum extrusion press, has been announced by L. H. Graves, general manager of the Extrusion Division.

Initial construction work on the aluminum-covered addition, to house the huge press and associated equipment, now is underway. The new structure will add 55,000 square feet of floor space, about 1¼ acres, to the existing plant. The expansion will cost more than $1,000,000, not including cost of associated facilities and equipment.

The new extrusion press will enable the plant to produce extruded shapes up to 14 inches in diameter — for example, aluminum light standards for use on expressways, railway car sections, truck and trailer body sections, aluminum tubing and conduit and wall panels.

G. E. Computer Expansion

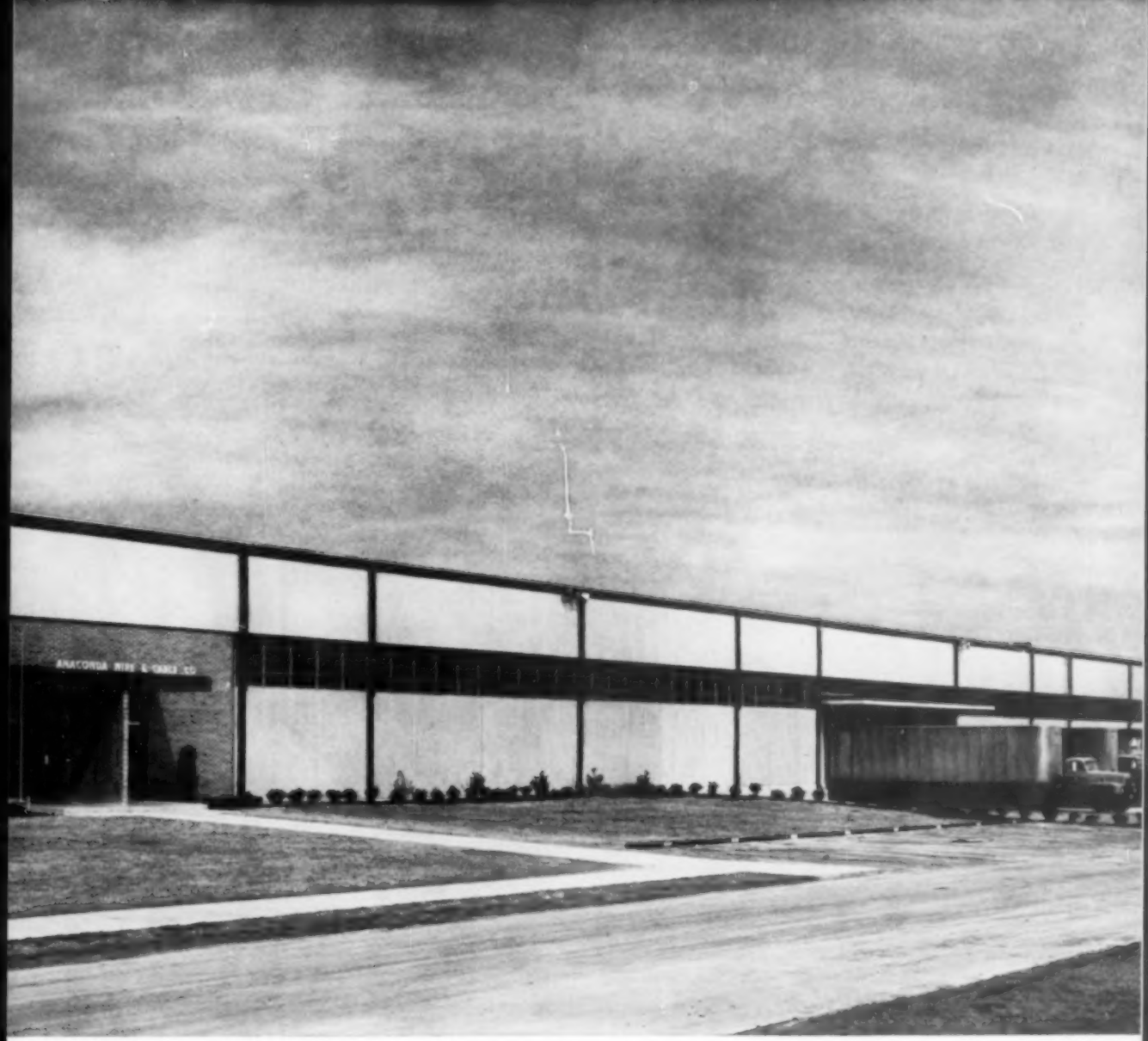
Anticipating that industry shipments of commercial computer equipment will increase 33 per cent within two years, **General Electric Company's** Computer Department announced plans for opening eleven new data-processing centers and ten additional sales offices.

Included in the data-processing centers scheduled for opening in 1962 are Atlanta; Washington, D. C., and Dallas. The Computer Department now operates data-processing centers at Phoenix and at Arizona State University. Site surveys are proceeding in seven other key cities.

The Computer Department is increasing production of computer peripheral or accessory equipment such as encoders, sorters, and printers; and is stepping up research and development programs through expansion of laboratory facilities. An intensive training program has been designed to triple existing sales force within nine months. Product-service, programming, and applications-engineering sections are being strengthened.

Data Processing service will be sold for handling payroll, inventory, accounting, production scheduling, sales analysis, engineering and scientific problems. Sales offices will be opened next year in Richmond, Atlanta, New Orleans, and Kansas City.

(*Continued on page* 22)



The modern wire and cable plant to serve the dynamic South

We have served the South for many years, and we have been proud to share in this region's unprecedented growth.

Now, this new Anaconda Wire & Cable Company plant will provide the way to even better service – thanks to its modern manufacturing and storage facilities and central location.

In fact, everything in this operation has been designed to give you wire and cable products of highest quality and deliver them to you FAST by truck or rail.

In addition, the complete research and engineering facilities and the varied manufacturing skills of the entire Anaconda Wire & Cable Company are available to – and stand behind – the new Watkinsville plant, an expression of Anaconda's pride to be part of the dynamic South.

Anaconda Wire & Cable Company
Southern District Sales Offices
Charlotte, N. C.–Atlanta, Ga.–Birmingham, Ala.
New Orleans, La.–Tampa, Fla.

SEE THE MAN FROM

ANACONDA®

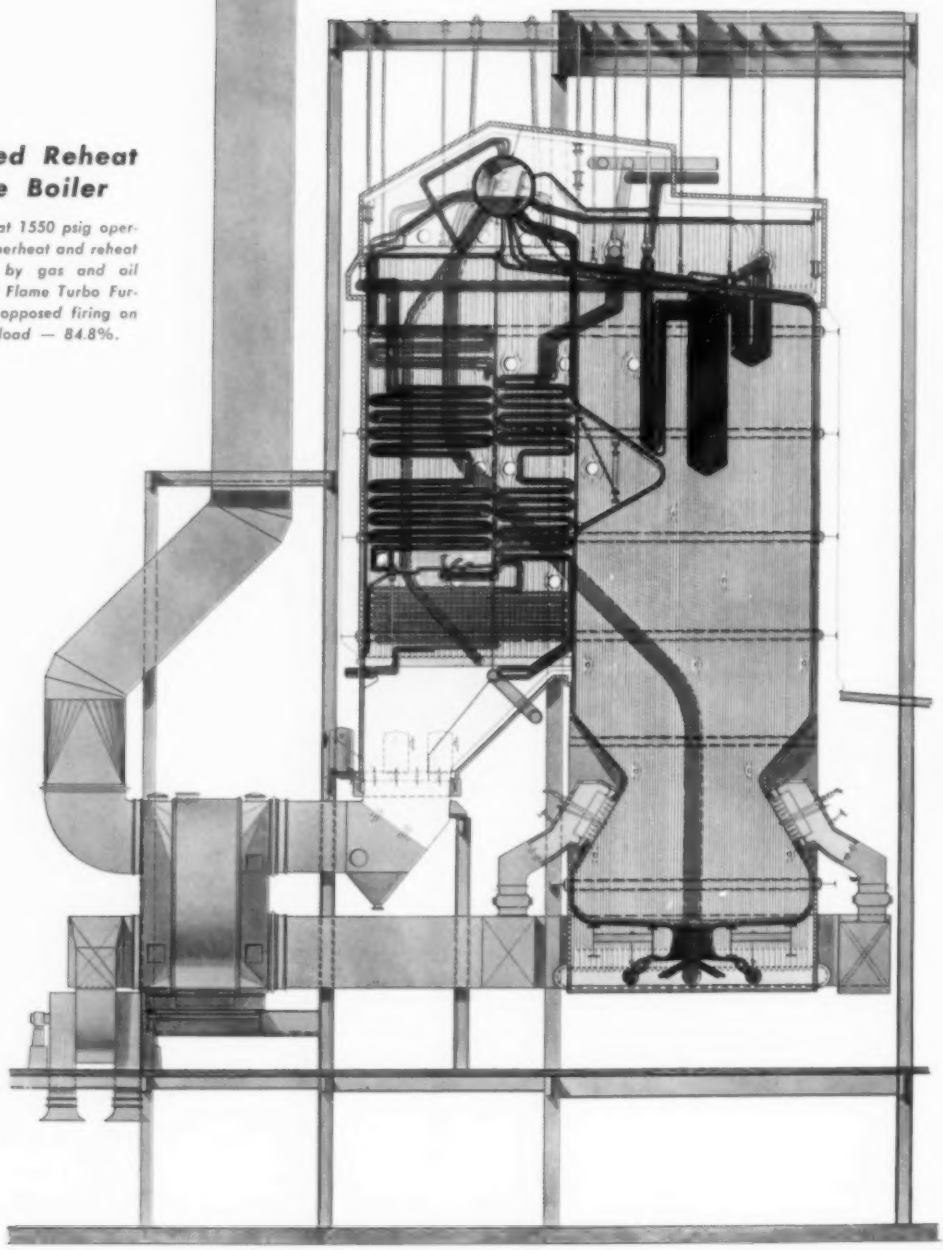
FOR ELECTRICAL WIRE AND CABLE

Located In the Great Permian Basin Area of West Texas

This Riley TURBO FURNACE Boiler can be converted quickly to coal

Riley Pressurized Reheat Turbo Furnace Boiler

Capacity — 825,000 lbs/hr at 1550 psig operating pressure and 1005F superheat and reheat steam temperatures. Fired by gas and oil through 12 Riley Directional Flame Turbo Furnace Burners positioned for opposed firing on one level. Efficiency at full load — 84.8%.



Ask your Riley representative for detailed information about Riley Turbo Furnace Boilers — or write direct to RILEY STOKER CORPORATION, WORCESTER, MASSACHUSETTS.

Sales Offices: Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Jacksonville, Kansas City, Los Angeles New Orleans, New York, Philadelphia Pittsburgh, Portland, Salt Lake City, San Francisco, Seattle, St. Louis, St. Paul, Syracuse.

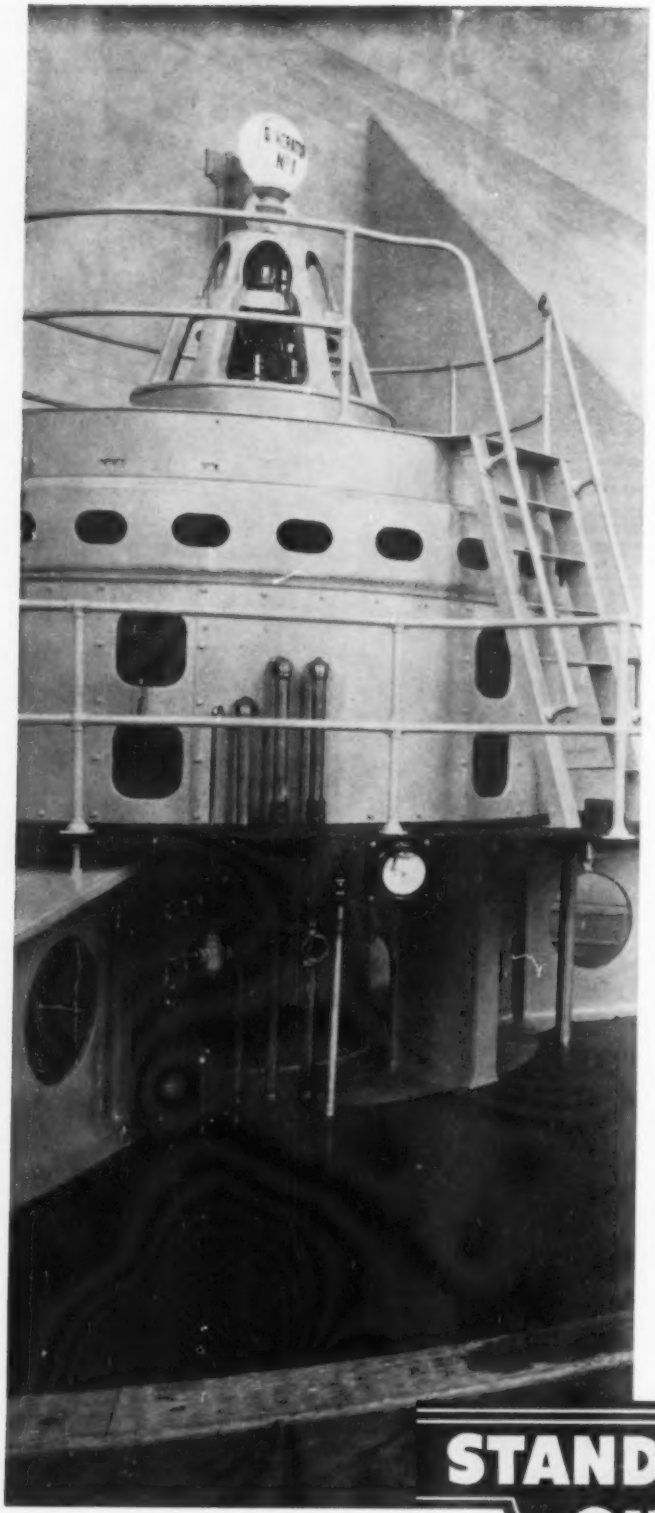
Burning gas and oil now, it may someday become both practical and economical for Texas Electric Service Company to fire its new Riley Turbo Furnace Boiler at Permian Basin Steam Electric Station, Monahans, Texas, with coal.

Because of the Turbo Furnace's unique multifuel characteristics this unit can be quickly and inexpensively converted to coal firing: combustion of coal, oil and gas produces substantially equal furnace performance with equivalent furnace exit temperatures simplifying steam temperature control changes; in addition the ability of the Turbo Furnace to stay clean and slag-free eliminates the need for slag-blowing equipment and sustains an efficient furnace performance indefinitely.

A careful survey of your plant by a qualified consulting engineer could show ways of making substantial savings in power costs.

RILEY

STEAM GENERATING & FUEL BURNING EQUIPMENT



right at scene of action

Continuous action in power equipment means friction, heat and wear —if the *right* lubricants aren't at the *right* places.

For 74 years STANDARD OIL has been *right* at the scene of action with *tailored-to-the-job* lubricants. These valuable years of experience in helping to solve a wide variety of industry's lubricating problems, plus the unexcelled resources for research behind STANDARD OIL Lubricants, are all available to you whenever you have an unusual problem in lubrication.

Whatever your lubrication requirements, your STANDARD OIL representative is able and ready to assist you in getting the *right* lubricant on the job. Call him today.

STANDARD OIL LUBRICANTS

STANDARD OIL COMPANY
(KENTUCKY)

one p-k scalefree 230* used for—

1 - supplying all domestic hot water
2 - for baseboard radiant heating
3 - for reheat in air conditioning system

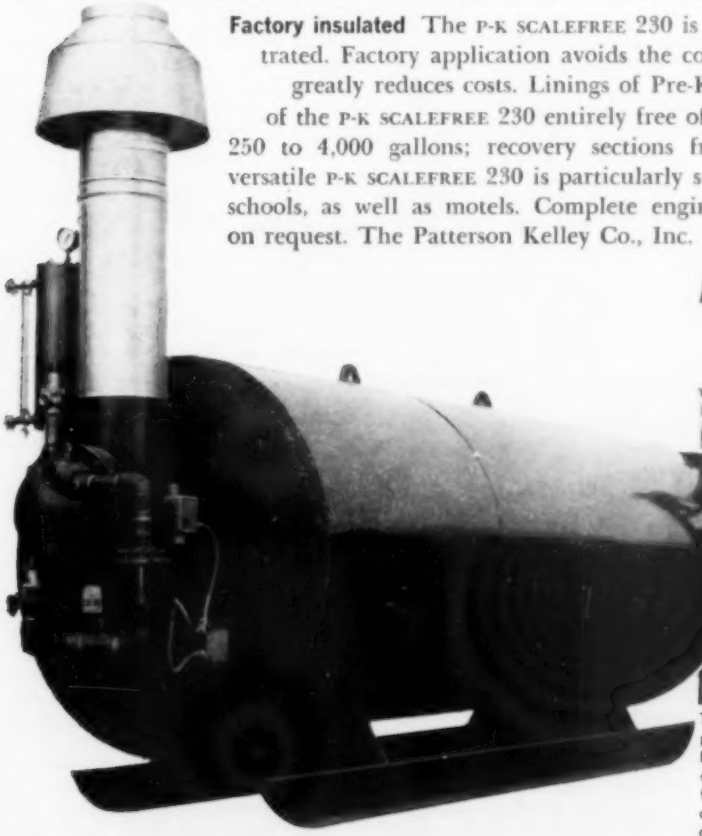
To supply all the hot water required for domestic service, baseboard heating, and reheat in air conditioning system, owners of the handsome Carousel Motel and Restaurant selected the new P-K SCALEFREE 230 . . . the industry's first indirect gas fired storage water heater. » » » High among reasons for choosing the P-K SCALEFREE 230 — It won't scale, and retains its rated efficiency, because heat transfer occurs below the temperature at which scaling minerals precipitate.

Quickly installed A complete and automatic package, the P-K SCALEFREE 230 can be skidded into place, hooked up and checked out quickly. There is no complicated piping or electrical work to run up installation costs. No stack is needed for extra draft. No foundation is necessary.

Factory insulated The P-K SCALEFREE 230 is available with factory insulation as illustrated. Factory application avoids the complications of on-the-site insulating and greatly reduces costs. Linings of Pre-Krete® or copper keep the storage section of the P-K SCALEFREE 230 entirely free of corrosion. Storage capacities range from 250 to 4,000 gallons; recovery sections from 390,000 to 2,215,000 B.T.U. The versatile P-K SCALEFREE 230 is particularly suited to office buildings, institutions and schools, as well as motels. Complete engineering and performance data available on request. The Patterson Kelley Co., Inc.

Patterson Kelley

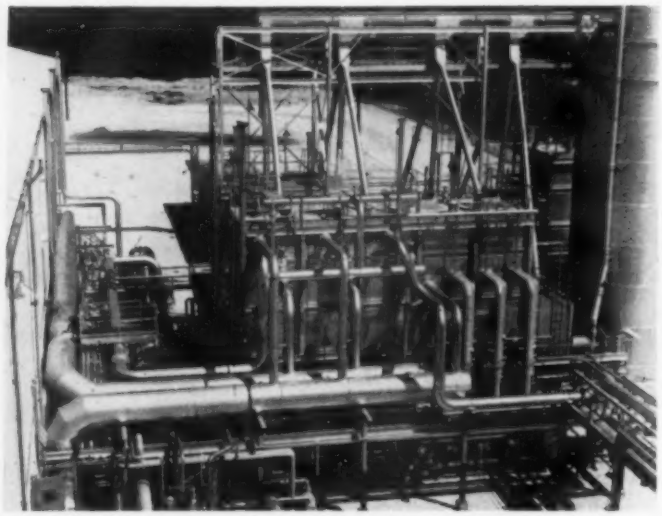
Water Heater Division
101 Morgan Avenue, East Stroudsburg, Pa.



Heating-Air Conditioning Contractor, Kingston Electric Co., Kingston, Pa.

The Carousel Motel and Restaurant, with a capacity of 600 persons, recently opened at Wilkes-Barre, Pa., is owned by William Heck, William Heck, Jr., and Thomas Heck. They chose the P-K SCALEFREE 230 because it offered ideal performance and economy features for a service business such as theirs. The Pre-Krete lined unit has a storage capacity of 500 gallons, and a recovery rate of 325 gallons per hour from 40°F to 140°F.

*Patent pending



Florida Hydrogen Plants

U. S. Air Force declassification has revealed production capacity of the largest known liquid hydrogen plant, according to an announcement by **Air Products, Inc.,** builder and operator. Located in the Everglades near West Palm Beach, Florida, the plant is capable of producing 60,000 pounds a day of liquid hydrogen — a rate far in excess of previously known liquid hydrogen production.

The secret liquid hydrogen program was started in early 1956 by the Air Research & Development Command and Air Products with the building of the first production plant in Painesville, Ohio, capable of producing 1,500 pounds per day. Before this plant went on stream, Air Products began construction of a second plant, and the third plant went on stream in early 1959.

The three plants were referred to as the "Bear" series, the large plant being referred to as "Papa Bear" and the medium and small plants referred to as "Mama Bear" and "Baby Bear" respectively. "Papa Bear" and "Mama Bear" are both located in the Florida Everglades near West Palm Beach.

The entire program was kept a close secret until mid-1959 when ARDC revealed the existence of liquid hydrogen production facilities. Until the recent announcement, however, the capacity of the plants had not been made known.

PLANT PERSONNEL

D. J. Simmons has been promoted to the newly created position of chief of electronics systems in the Electronics Division of Chance Vought, Dallas, Texas. He previously had been chief of ground support systems for the division. Promoted to the position of chief scientist was **J. R. Campbell,** formerly staff assistant, electronics engineering, and chief of the electronics design section.

Newly appointed purchasing agent for Southern Land, Timber and Pulp Corporation is **J. W. Dobson.** He will make his home in Chamblee, Georgia, while coordinating purchasing activities during the design stages of the $42,000,000 mill to be built on the Chattahoochee River at Cedar Springs.

Dillard Cantrell, formerly chief engineer for Trinity Steel Company, Inc., Dallas, Texas, has been promoted to the position of assistant to the president. Mr. Cantrell, a graduate mechanical engineer from Southern Methodist University, has been with the company five years. He was previously on the engineering staff of Ebasco.

A. David Preston has been appointed staff administrator for the engineering and development department of the Chemstrand Corporation, Decatur, Alabama. Mr. Preston joined Chemstrand in 1954.

Charles S. Betts, Jr., Potomac district manager of the Virginia Electric and Power Co., Alexandria, Va., has been appointed assistant to the president at Richmond. **Leon D. Johnson, III,** formerly assistant district manager at Richmond, replaces Mr. Betts at Alexandria.

Charles F. Weed was resident engineer during construction of the new electric furnace to produce silicon metal at Reynolds' Listerhill (Ala.) Reduction Plant. **Albert E. Wolfe** was in charge of electrical work. Both men are on the plant engineering staff. **R. B. Newman** is plant manager. The silicon plant superintendent is **Delbert A. Truman.**

John Turnbaugh has been appointed manager of The Black & Decker Manufacturing Company's Towson, Md., plant, replacing Karl B. Salanda. Mr. Turnbaugh, who has been with the company 25 years, was formerly tool engineering manager.

Lowell Culbertson, acting mill manager of Bowaters Southern Paper Corp., has been promoted to mill manager at Calhoun, Tenn. Mr. Culbertson, a graduate of the University of South Carolina, joined the company's engineering department in 1954, shortly before the mill went into production.

Appointment of **Oscar Pearson,** a native of Tuscaloosa, as executive vice-president of United States Steel's TCI Division at Birmingham, was recently announced. Mr. Pearson succeeds **James W. Kinnear, Jr.,** who has been transferred to Pittsburgh.

Computer Conference — St. Louis, Nov. 9-11

The second Power Industry Computer Application Conference will be held on November 9-11 at the Chase Hotel, St. Louis, Mo. The conference is co-sponsored by the Power Division and Computing Devices Committee of the **American Institute of Electrical Engineers.** Program chairman is Dr. E. L. Harder of Westinghouse Electric Corp., Pittsburgh.

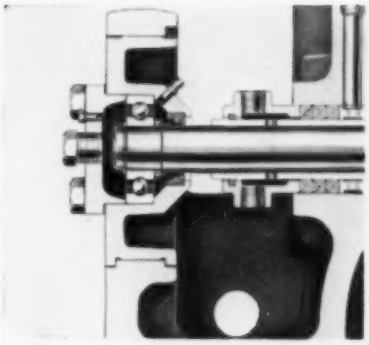
Highlighting the meeting theme, "Computers for Engineering and Power," will be two featured speakers at the luncheon meeting: J. W. McAfee, president of Union Electric Company; and M. W. Humphrey Davies, professor of electrical engineering at the University of London.

Latest developments in digital computers for utility engineering and plant automation will be presented in 25 papers.

(*Continued on page 70*)

PUMPAGE

Goulds news about pumps for process industries



When life hangs by 5/1000 of an inch

Whether life is long or short depends on the proper fit of shaft to bearing. Destroy the fit by 5 to 10 thousandths of an inch—and you shorten bearing life. Therefore Goulds pump shafts are ground and polished to within the tolerances specified by bearing manufacturers. To insure complete accuracy, bearing housings are bored by a special machine. Careful handling when removing and replacing bearings in the field will also go a long way toward protecting fit and helping bearings live to a ripe old age.

Now... ISO-40 to guard against corrosion and abrasion

A stainless of great strength, ISO-40* alloy survives under some very harsh conditions. Strongly oxidizing nitric solutions don't faze it. It's a match for 50% sulfuric at r.t. It resists corrosion, abrasion, high shock. Can be furnished with a B.H.N. hardness of 320, tensile strength of 145,000 psi. A pump with an ISO-40 impeller circulated a slurry of sodium sulfite and sodium carbonate for 17 months with negligible impeller damage. Speaking of pumps, did you know you can get Goulds chemical pumps in ISO-40?

*Registered trademark of Empire Steel Castings, Inc.

Circulating crude phthalic anhydride

One company does it with two Goulds Model 3171's. Each delivers forty gallons a minute of this sluggish solid (sp. gr. 1.2) from a depth of 11 ft. at temperatures from 300 to 525 F. How? The discharge pipe, which extends from pump through pit cover, wears a steam jacket. Temperature stays up—phthalic anhydride stays fluid. The long pipe has a 3" expansion joint. Additional steam-jacketed pumps of other and varying lengths give flexibility to the installation. For details on how Goulds Model 3171's can help *you* move uncooperative solids, write for Bulletin 726.2.

Nuclear nomad of the seven seas

N. S. Savannah, first atomic-powered merchantman, will call at the seaports of the world as a symbol of the peaceful use of nuclear power. The 21,800-ton ship has a practically foolproof power plant. Its pressurized-water nuclear reactor uses uranium oxide fuel. Goulds Model 3655 (close-coupled centrifugal) pumps the radioactive waste water on both bilge and ballast service. The Model 3655 is available in 23 sizes with capacities to 2000 gpm, heads to 400 ft. Pump and motor are a single, compact unit, easy to install and ready to run. Standardization of parts holds down inventories. For full details, including specifications, construction information and performance charts, write for Bulletin 710.1.

NEW "king-size" vertical... capacities to 3180 gpm

Here are all the details on Goulds newest heavy-duty centrifugal sump and process pump—the "L" size Model 3171. Unit available in 316 stainless and other special alloys. Specifications, sectional views, construction materials, performance curves, dimensions—all are clearly given in Bulletin 726.2. For your copy, write Goulds Pumps, Inc., Dept. SPI-110, Seneca Falls, N. Y.

GOULDS PUMPS

INDUSTRY SPEAKS

Things That Must Be Done

Abstracted from a speech by LESLIE B. WORTHINGTON, President of U. S. Steel, before Farm Equipment Institute members at Dallas, Texas on Sept. 28.

AMONG THE CAUSES of inflation, of course, are a shortage of goods and a shortage of labor. We now have, in general, an adequate supply of goods and enough people to produce them. If we can couple this condition with highly necessary restraints on cost-push inflation and excessive governmental spending in this country, there will be, at last, the hope that the curse of inflation may recede from this land.

Real growth is what we want. And, given investment stimulation, creative enterprise, and a prosperous consuming public, we can have real growth.

With great emphasis, let me say that the eyes of the whole world must inevitably fall on the enterprise structure of America in this matter of economic growth. We shall be watched with hope by our friends — but with suspicion by many, and with malice by some. I say we dare not lose. But what do we actually do — how do we fulfill our role?

First, there is the controlling factor of our attitude and perspective in facing the job we have to do. I feel that there is a real danger of forgetting — if only momentarily — how strong our country really is, how great its accomplishments are, and how dynamic its future will be.

With this in mind, my own company has taken a positive step in helping to gain proper perspective by embarking on a program called "Watching America Grow," which will report to millions of people the news of America on the move. The program is designed to reflect the real achievements and true economic picture of America.

Let's turn now to another key area in our fight to prove the superiority of our enterprise system — it is the urgent need for innovation. This mysterious element deriving from and dependent on new knowledge, new techniques, new skills, new organizational schemes brings an added dimension to our economic thinking.

Solomon Fabricant of the National Bureau of Economic Research has found that from 1871 to 1951, technological advance accounted for 90 per cent of the rise in U. S. output per man-hour. Robert Solow of M.I.T. finds that from 1909 to 1949, 87.5 per cent of the growth in output per man-hour was due to improved technology. Then Benton F. Massell of the Rand Corporation finds that technology was a 90 per cent factor from 1909 to 1955.

I submit that the private enterprise system is the world's best source for innovation. It has created new knowledge and new products on a scale heretofore unknown. And our system insures that this output is channeled continually into markets that best fulfill the desires and aspirations of our people.

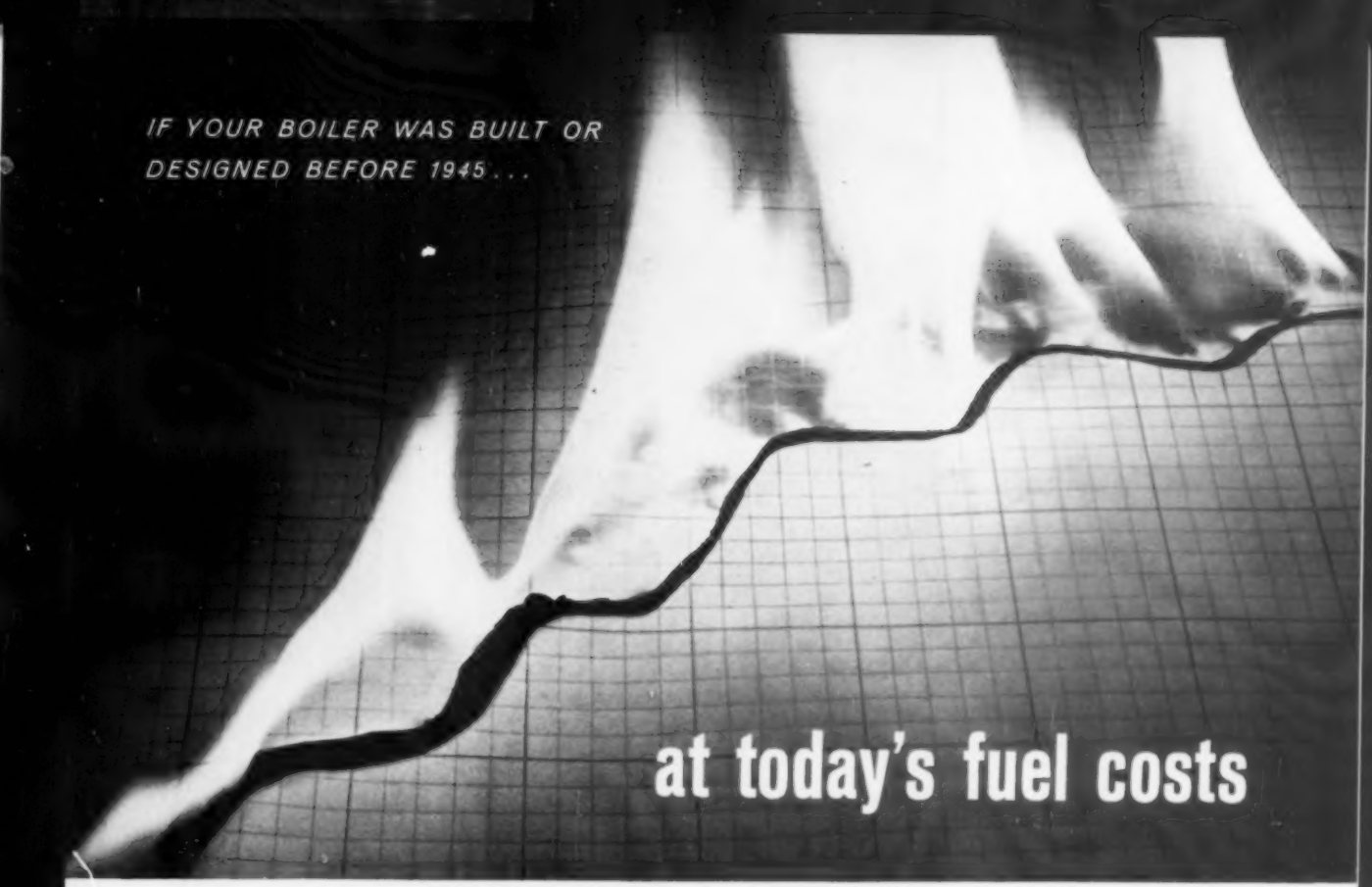
I can summarize my feelings about innovation this way: one must be willing to be first, not once in a while but on many occasions. Our system rewards the early bird and not always the copiers and followers. And our system of private, competitive business must continue to demonstrate that it is the most productive method for releasing the vast potential of creative human enterprise.

There is another important part of doing the job which will prove the superiority of our system. To produce a successful innovation, or make any successful move in business, one must first make a decision — and it must be the right decision. As any businessman knows, good decision making is what makes innovation and the rest of business work.

Modern management problems, compared with most of those of the past, are as different as tic-tac-toe and three-dimensional chess. But there are decision-making techniques for solving these new, complex problems, and we must have management people who can use them effectively. The successful enterprise of the future will be the one which keeps pace in decision-making techniques, to the same extent that it remains abreast of developments in the fields of production, marketing, finance, and science.

And, unless the dedication to making our own decisions becomes absolute, the free enterprise system may become obsolete. It isn't only that advocates of government intervention want to put their men at your work benches, they also want government to make your decisions for you.

In the final analysis, our system, and that of the Soviets, come down to a battle between men's minds and consequently for men's minds. We must immediately and forcefully use the best decision-making techniques our minds can devise.



you may be paying for it a second time!

Are you operating a boiler that was designed in the day when fuel costs were much lower? Just since World War II, fuel prices have soared. And these higher costs put a premium on "little" inefficiencies that might have been ignored when your boiler was built.

Conversion is not the answer. You cannot buy efficiency in a boiler designed for solid fuels simply by switching to a conversion-type oil or gas burner. The answer is a *truly* packaged Cleaver-Brooks boiler — with all components designed to work together — fully factory-assembled and fire-tested.

To further provide and maintain top efficiency, modern Cleaver-Brooks packaged boilers offer a combination of fuel-saving design standards that cannot be found in any other boiler — at any price.

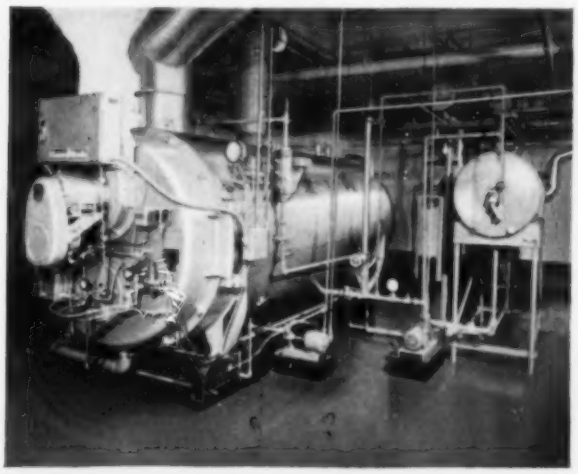
This combination of features — *four-pass design, forced-draft combustion, updraft construction and all the advantages of five square feet of heat-transfer surface per boiler horsepower* — puts your fuel costs down where they belong.

All this is provided by Cleaver-Brooks in the most compact, automatic packaged unit on the market. Sizes through 600 hp . . . oil, gas and combination oil-gas firing . . . larger sizes in Cleaver-Brooks Springfield water-tube boilers. *All* models are expertly started for you by a trained field engineer.

See your local Cleaver-Brooks agent for more detailed information, or write for the booklet, *How to Select a Boiler.*

GETTING MORE HEAT FOR THE FUEL DOLLAR

The W. T. Rawleigh Company, manufacturer of toiletries, medicines and food products for the home and farm, replaced two old firebox boilers in their Memphis, Tennessee, branch with one fully automatic, combination-fired CB boiler. Mr. James Trindle, office manager, reports: "Our records show . . . 36.4% less fuel consumed during winter months that averaged about 12% colder than the previous year. We're getting greater fuel economy than we expected."

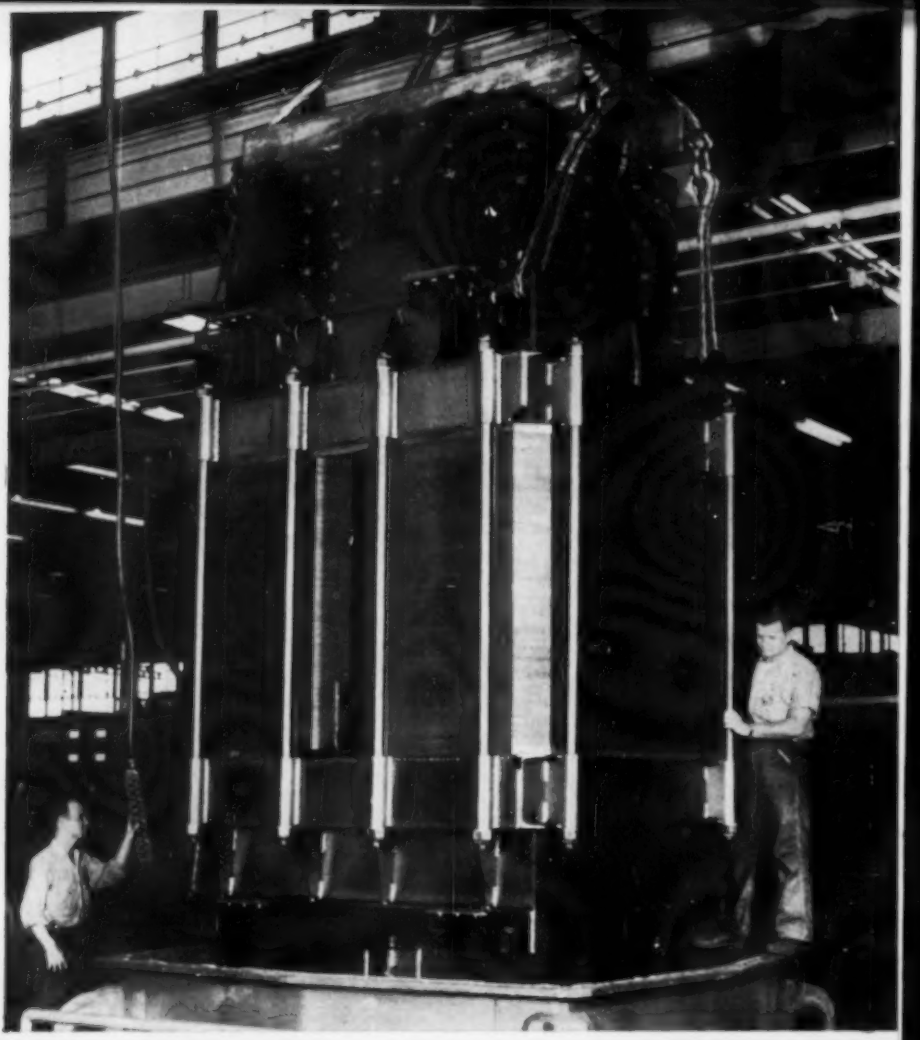


Cleaver Brooks®

ORIGINATOR AND LARGEST PRODUCER OF PACKAGED BOILERS

CLEAVER-BROOKS COMPANY

Dept. M, 305 E. Keefe Ave., Milwaukee 12, Wisconsin



THIS POWER TRANSFORMER will have increased kva capacity, efficiency and reliability after complete modernization. Westinghouse Repair Plants will modernize both power and distribution transformers. Here, the uprated core and coil assembly is reinstalled in transformer tank.

MOTORS are rebuilt to rigid new-equipment standards. Improved coils and new insulations like Super COILIFE* are engineered to give long-life, reliable performance.

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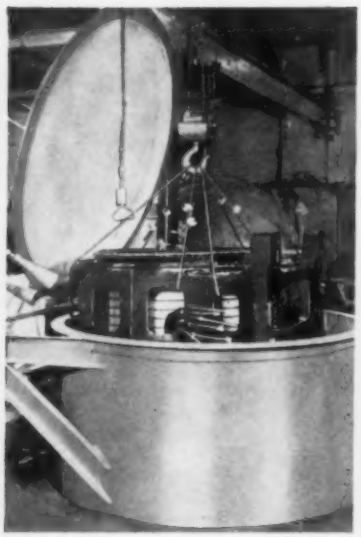

LARGE ROTATING EQUIPMENT can be uprated by Westinghouse service. Repair techniques include application of exclusive Thermalastic® insulation that withstands moisture, dirt and other contaminants, greatly extends operating life of the windings.

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Westinghouse repair service builds years of new life into your equipment

For fast, dependable, quality repair service, check your nearby Westinghouse Repair Plant. It's completely equipped to handle routine or troublesome jobs . . . and staffed by experts who excel at making equipment as good as new, electrically and mechanically. All repairs verified . . . and guaranteed!

Here is only a hint of the scope of Westinghouse repair service. For details, secure a free copy of "Modern Repair Craftsmanship" from your Westinghouse representative. Or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. You can be sure . . . if it's Westinghouse.

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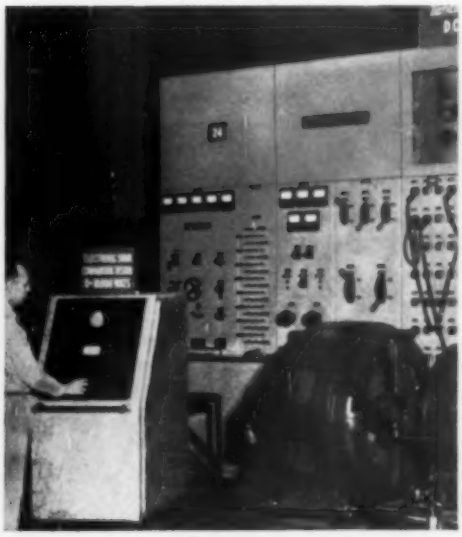

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RAPID SERVICE IS ALWAYS NEARBY—42 Westinghouse Repair Plants are located coast to coast, ready to get your equipment back on the line with the *right* repairs made in a minimum length of time.

COMING IN DECEMBER
THERMAL INSULATIONS

Reference Guide

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for the

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Reference Guide and Buyer's Directory (included in SPI's regular December '60 Mechanical Engineering-Power Show Edition) will feature:

NEW PRODUCT BRIEFS & BULLETINS—asbestos, cork, felt, glass, wool, magnesia, mica, silica — fills, sheets, cements, blankets — for tanks, boilers, evaporators, piping, processing equipment, etc.

SALES ENGINEERS serving you in the Industrial South-Southwest — Directory type listings, including name, address, and phone numbers.

This is SPI's annual technical service aid in the **THERMAL INSULATION** field for 1960.

This edition (also featuring the Mechanical Engineering-Power Show) will be a real service to you and to 17,100 other Consulting-Engineering-Operating-Maintenance personnel in over 12,000 Southern & Southwestern industrial plants (manufacturing, process, utility and service).

TIMELY COMMENTS

Quality and Confidence Can Speed Progress

A WARNING that American business must inject quality into its productivity or lose its world position was voiced by a General Electric executive to a group of chemical and petroleum engineers recently in New Orleans.

S. W. Corbin, general manager of General Electric's Industrial Sales Operation, speaking at the company's second annual turbine seminar, said that technological innovations have made obsolete, almost overnight, the traditional belief that increased raw output would guarantee our industrial leadership.

In supporting his contention, Mr. Corbin pointed out that much of American industry already has more capacity than it needs, and we are losing ground. Added to this, he said, is the fact that the classic economic triumvirate of Land, Labor and Capital no longer motivates our economic growth.

"New technology," he said, "is the answer to our survival. The kind of productivity we need is not quantitative but qualitative; not just more products but better products, products that are made more efficiently, products that are sold at a more attractive price, and products that satisfy different needs as well as products that satisfy the same needs in a different way."

But, Mr. Corbin said, before this is possible, industry must overcome another challenge. Customers must discard the usual buyer-seller relationships and place more trust in suppliers.

Only by working closely with a customer in advance, can a manufacturer learn enough about his process to efficiently and economically apply the complex equipment and concepts bred by technological innovations, he said.

To emphasize this point, he added: "At today's competitive pace, technological innovation cannot await a letter of commitment. The answers to the problems you will encounter in the next year's application must be in a laboratory some place right now."

As an example of this need, he stated that General Electric now has the technology to make the completely automated pipe line a reality. However, before this and other chemical and petroleum processes can be automated there must be a greater exchange of information between the two industries.

Another important by-product of advanced technological development Mr. Corbin touched on was the growing need for engineers to become more active in business decisions. He said they must keep management informed of the benefits of new research techniques and developments.

The one-day seminar was initiated to present information on new turbine engineering developments and encourage an exchange of ideas between General Electric and personnel in the chemical and petroleum industries.

EDITOR'S NOTE: While Mr. Corbin's statement deals primarily with the need for confidence on the *industry* level, the same need exists for confidence on the *individual* or personal level. Company plans and intentions must be implemented by the men on the job — the equipment salesman and the plant engineer or other purchaser.

The need for good salesmen and fair buyers has never been greater. This man-to-man contact is the point where confidence starts. Management in both the buyer and seller organizations can do much to sponsor confidence by continually encouraging their men to take *right* action on sales and services.

Kellogg's New Power Piping Plant

$4-Million Manufacturing Facilities Uniquely Equipped to Undertake Any Steam-Electric or Nuclear Assignment

Now in production at Williamsport, Pa., the Kellogg Power Piping Division's new plant is the most modern ever designed specifically to manufacture power piping for electric generating stations.

With these new facilities, Kellogg is equipped to undertake any steam-electric or nuclear assignment with greater efficiency, economy, and speed than ever before in its 40-year history of power piping leadership.

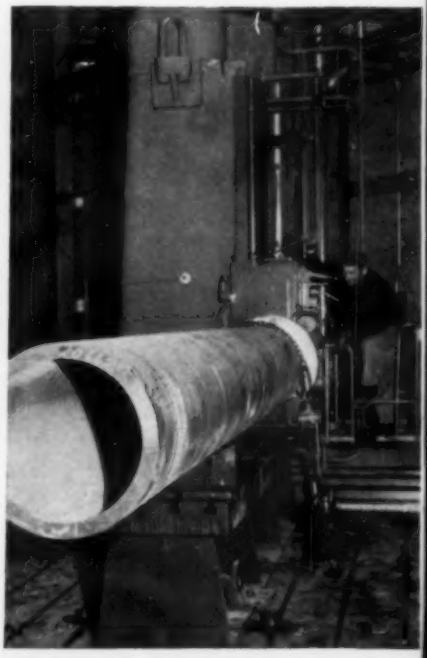
New equipment now in operation includes the latest machinery, worth in excess of $1 million, for machining, bending, and welding ferritic, austenitic, stainless, and other materials into piping of any wall thickness.

Carefully planned manufacturing sequences, on a production-line basis, assure a smooth and uninterrupted flow of operations from one end of the 900-ft. plant to the other.

Testing equipment for quality control includes the latest in electronic, radiographic, and ultrasonic advances. Two special vaults with 30-in. walls permit safe inspection with Iridium 192 and Cobalt 60.

Completely equipped metallurgical and welding laboratories, continually working to improve materials and techniques, aid in solving new manufacturing problems and are also available to clients as a service laboratory.

Kellogg's Power Piping Division welcomes inquiries on its new facilities, and extends a cordial invitation to engineers to inspect them personally.



POWER PIPING DIVISION • THE M. W. KELLOGG COMPANY

Plant and Headquarters: Williamsport, Pa. Sales Offices: 711 Third Ave., New York, N.Y.

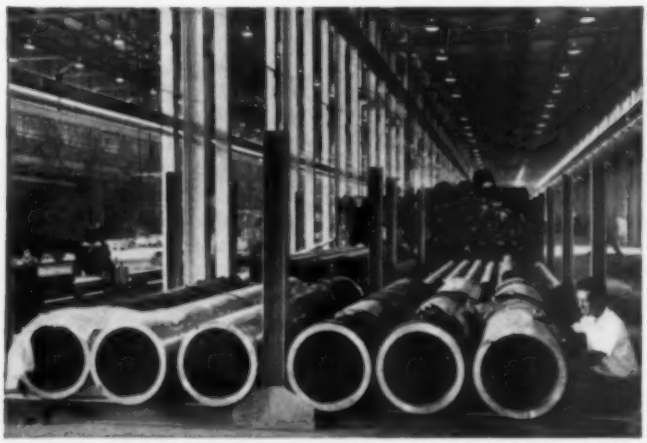
A SUBSIDIARY OF PULLMAN INCORPORATED

KELLOGG

Offices of other Kellogg companies are in Toronto, London, Paris, Rio de Janeiro, Caracas, Buenos Aires

Now In Production at Williamsport

New manufacturing plant and headquarters of Kellogg's Power Piping Division—situated on a 50-acre site at Williamsport, Pa.

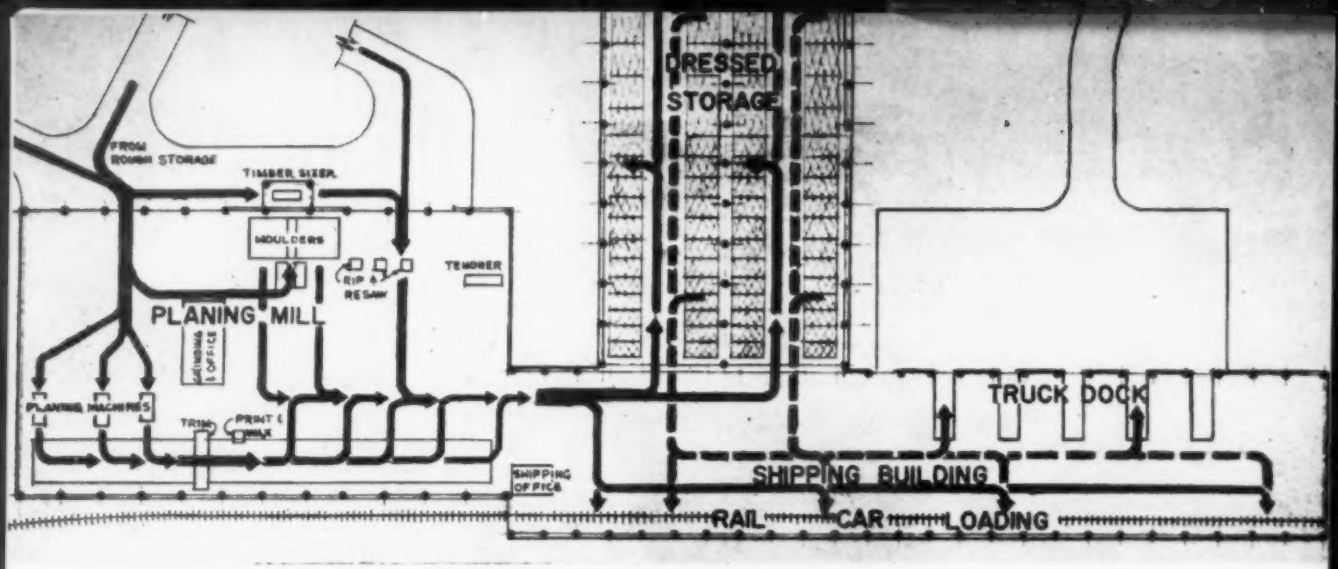


Above: Welding is a major phase of Kellogg's operations. Here, two thin-walled sections of stainless steel power piping are being joined by K-Weld—an inert gas-shielded technique of arc welding, patented by Kellogg, which assures long life.

Above: Raw materials bay, 40-ft. wide, extends the entire 900-ft. length of the plant. Piping and fittings are conveniently drawn from storage by overhead cranes and placed in the production line at any point in a planned manufacturing sequence.

Left: One of the new boring mills at Williamsport. Piping in machine is a stainless steel section—to be installed by Kellogg field erection specialists in the reactor sphere of a nuclear power station.

Left: Front entrance of Kellogg's new Headquarters Building. This ultramodern office building houses administrative, engineering, estimating, and accounting departments of the Power Piping Division. Sales offices remain at 711 Third Avenue, New York, N.Y.



Layout and Flow Chart, Planing and Shipping Facilities.

Lumber Company makes use of its own product — Keltys, Texas

Wood Construction Featured In Modernization Program

By ARTHUR H. KINTZ
Project Engineer
H. E. Bovay, Jr., Consulting Engineers
Houston, Texas

ANGELINA County Lumber Company, Keltys, Texas, has put into operation a new group of facilities designed to keep its mill among the most modern in the South. The latest plant improvements include the addition of a new planing mill, shipping building and dressed storage building which are arranged for efficient lumber flow.

Foundations

The planing mill foundation consists of footings with grade beams and a retaining wall on the side next to the railroad. The shipping building foundation consists of drilled footings with retaining walls in the form of deep grade beams between the drilled footing plinths. A network of ties between the footing plinths were installed to carry the lateral forces from both the compacted fills and the building columns.

The dressed storage building, because of its proximity to deep fills and a water reservoir pond area, required a type of design other than ordinary retaining walls which would have been too costly. The footings were placed in suitable soil stratum below natural grade and the foundation was then brought up as columns and the soil compacted after they were poured.

Ties in the form of additional reinforcing across the floor of the building, from side to side, with a spandrel beam around the building, tied the columns together laterally and longitudinally at the top. Thus a stable foundation for the concentrated floor load in the dressed storage building was accomplished without the heavy expense of retaining walls up to 14 or 15 feet in height.

Wood Construction

It will be interesting and gratifying to lumbermen to note that all of the buildings were constructed of wood. Both sawn timbers and laminated kiln dried lumber were utilized. Preliminary investigations leading to the decision to use wood rather than steel for the framing of the buildings indicated that the cost of using wood or steel was practically identical.

Savings in time of fabrication and erection of wood structures over-balanced the factors favoring the use of steel. Other factors favoring wood included availability of the timber and lumber at the site, proximity of laminating facilities in nearby Houston, the use of local labor, and the elimination of freight costs involved with steel.

The planing mill and shipping building have a wood roof deck with built-up roof surface, and corrugated iron siding. The dressed storage building is covered on roof and sides with corrugated iron.

Planning and Design

The old planing mill was placed in operation some 60 years ago and had become quite expensive to

operate since most operations were manual and very little conveying machinery was available. It was built up on a rather weak floor quite high above natural grade and, therefore, could not accommodate the carriers and lift trucks utilized in the remainder of the plant.

It occupied a location about midway of the length of the proposed new shipping building, and the necessity of keeping the old planing mill in operation until the new one was ready to go required step by step construction of the new buildings. These problems were overcome successfully, however, by careful scheduling, and Angelina lost only a few days of partial productive capacity in the changeover.

Planing Machines

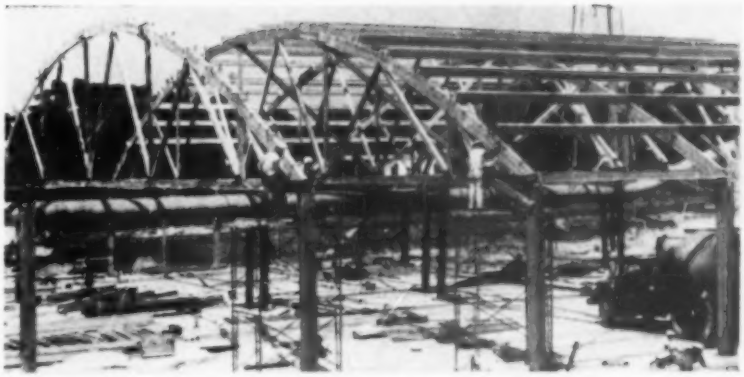
In the new planing mill, the major production is handled through three planer-matchers. One of these is a new S. A. Woods planer-matcher of the angle cutter head type, with a double profiler, designed for increased production and less down grading. The other two planing machines were relocated from the old planing mill. The new machine and one of the reused ones are set up for high efficiency operation with the installation of automatic feed tables and package infeed breakdown hoists. The third machine was installed with automatic feed table, but without a package infeed breakdown hoist, since the stock that is fed to this machine is of such varied nature that complete mechanization was impractical.

Handling

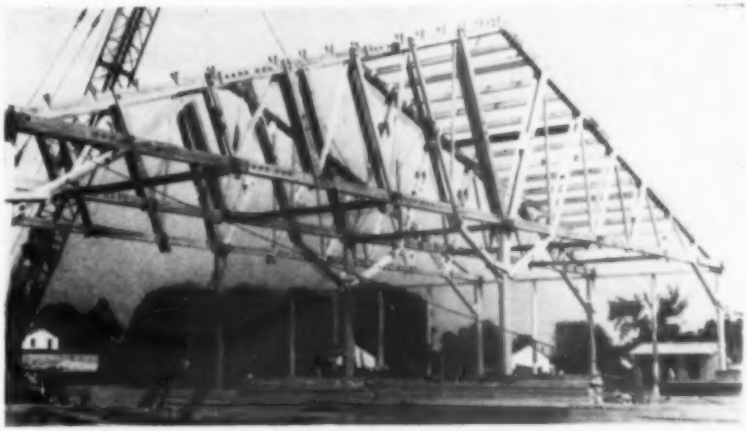
Carriers and lift trucks are used for unit package handling of lumber in the new operations in keeping with the method selected and in use in the rest of the plant from the kilns through rough storage.

All three of the planers are set adjacent to a grading conveyor. All material discharging from the machine can be conveyed past a grading area to the feed section of an Irvington trimmer, followed by a single end two position printer and waxer.

Although all material can be conveyed to the trimmer, a set of drop gates is provided in the grading conveyor, so that stock can be dropped out and sorted separately instead of being trimmed.



Bow-String Truss Being Erected in Planing Mill Building.



Dressed Storage Building Being Erected.

Continuing on from the trimmer, printer and waxer section is a 100 foot section of sorting conveyor with space for 16 different sorts of finished lumber. At the end of the sorting conveyor an automatic package reloader will allow the predominant items of finished lumber to be repackaged without manual labor.

Several other operations round out the manufacturing process to enable the planing mill to meet all the demands of Angelina's customers. These include two reused moulders followed by sorting table conveyors, and cut-off, tying, and packaging facilities; a vertical resaw; a straight line ripsaw; a multiple ripsaw; a double-end tenoner; and a timber sizer.

Everything in the new planing mill is driven electrically, and a good level of lighting is provided in all manufacturing, loading, and storage areas.

Mill Building

With all these various operations determined in the early stages of planning, many operating layouts were made by the engineers to obtain a system that would be efficient, economical, flexible and compact. Centralization was important to reduce handling and make the best use of a minimum operating crew. Consideration of all these factors allowed the selection of a planing mill plan with all operations except the timber sizer placed in a 140 foot clear span width by 240 foot long planing building.

To keep the operating layout intact and allow relatively free movement of carrier trucks in the building, it was decided to design the building free of interior col-

(*Continued on page* 66)

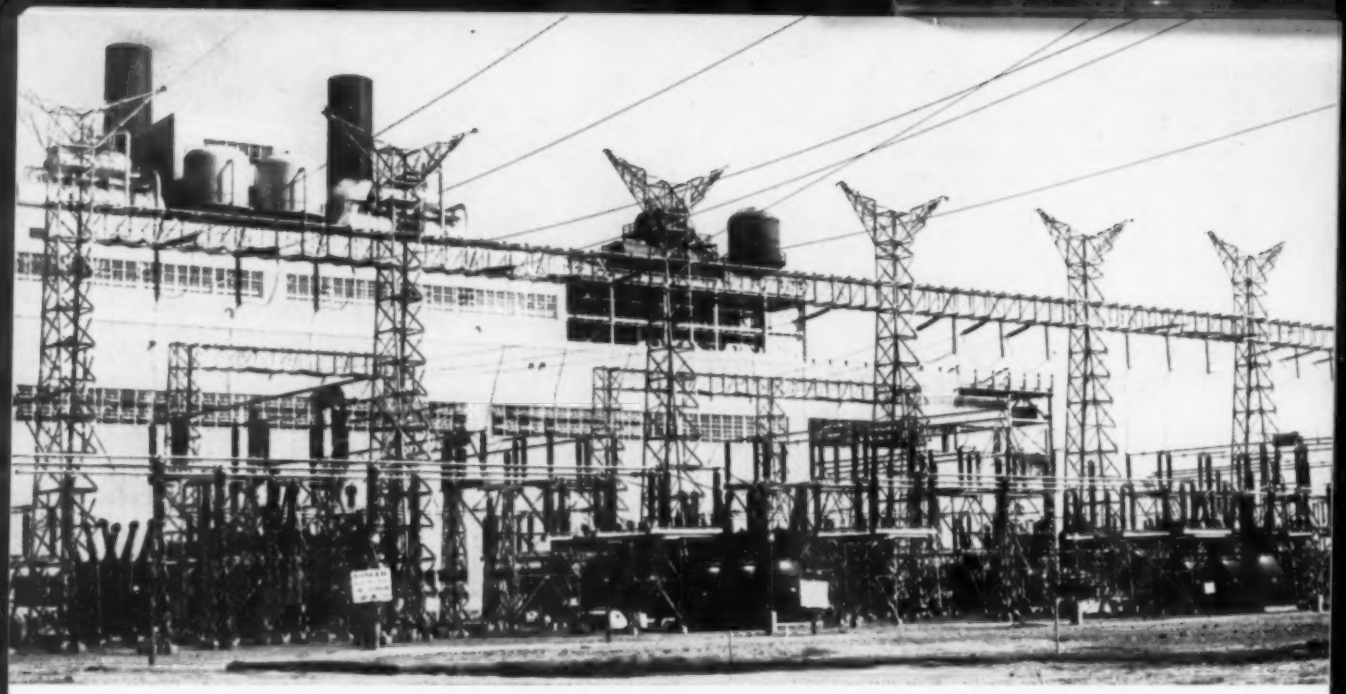


Fig. 1—General view of substation at SEGCO No. 1 steam plant.

Design Features of Segco Substation

Output of Generating Plant Switched Through 230 kv Ring Bus

By M. P. SMULL and H. B. COX
Principal Engineers, Southern Services, Inc., Birmingham, Alabama

THE SOUTHERN Electric Generating Company's No. 1 Steam Plant, now under construction near Wilsonville, Alabama, will, when completed, be one of the largest steam-electric generating plants in the nation. It is being designed for the ultimate installation of six 250,000 kilowatt generators, two of which are presently in commercial operation, with Units No. 3 and No. 4 under construction. Unit No. 3 is scheduled for operation in 1961, and Unit No. 4 in 1962. The Southern Electric Generating Company is a jointly owned subsidiary of Alabama Power Company and Georgia Power Company, each company being entitled to one-half of the available output of the plant.

The general features of this plant were described in an article appearing in the September 1960 issue of Southern Power and Industry, therefore this article will be confined to a description of the 230 kv step-up substation through which the plant output is delivered to the transmission networks of the two operating companies mentioned above. The factors affecting the basic design decisions, and some features of design and construction felt to be of general interest, will be described in this article.

High Voltage Ring Bus

The Segco installation is one of the very few in this country where the output of a large generating plant is switched through a high-voltage ring bus. The output of the first two units is switched to three 230 kv transmission lines, two to Georgia Power Company and one to Alabama Power Company. The generating units and lines are connected to the ring bus as shown in the single line diagram, Fig. 2. Additional lines will be constructed as the plant output increases.

Careful cost analyses showed that the ring bus would be the most economical switching arrangement from the standpoint of first cost, but before the final decision to use the ring bus method of switching, consideration was given to the inherent limitations of such an arrangement and the possible effect on system operation.

The investigations showed that system stability could be maintained should the bus be split in such a manner as to separate the two systems. Bus faults have been very rare at the stations in service on other associated systems and it was felt that with good station shield-

ing and proper attention to design details, a bus fault would be a remote possibility. These considerations led to the selection of a low bus using rigid aluminum tubing and welded joints insofar as possible. A typical section through the switching station is shown in Fig. 4.

First, this article will touch briefly on some of the important electrical features of the station, then conclude with some of the physical and structural aspects of interest to designers. Some features were developed during construction which will be of interest to anyone having to consider the use of welded joints of aluminum.

Control System

A separate control room is provided for the 230 kv substation. It is in the form of an annex to the turbine room between Unit No. 2 and future Unit No. 3 adjacent to the switching station. This room is provided with its own independent air conditioning system. A benchboard with mimic ring bus, associated control switches, etc., is provided for a central control point. On vertical panels, arranged in a "U" shape around the benchboard, are mounted the metering for generators, lines, and system interchange. A thirty-two channel oscillograph, a high speed millisecond operation recorder, and teletype equipment are included.

The vertical panels in the control room form a wall dividing the annex into two areas. In the area behind the vertical panels are located relay racks, carrier equipment, and other miscellaneous

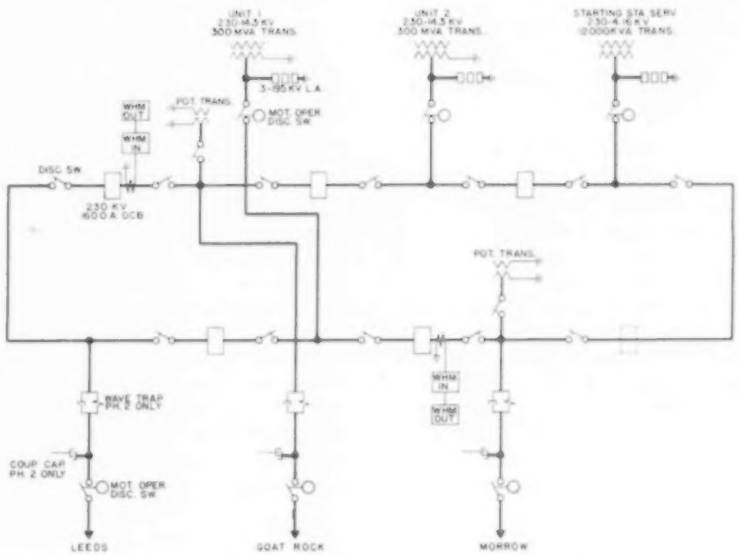
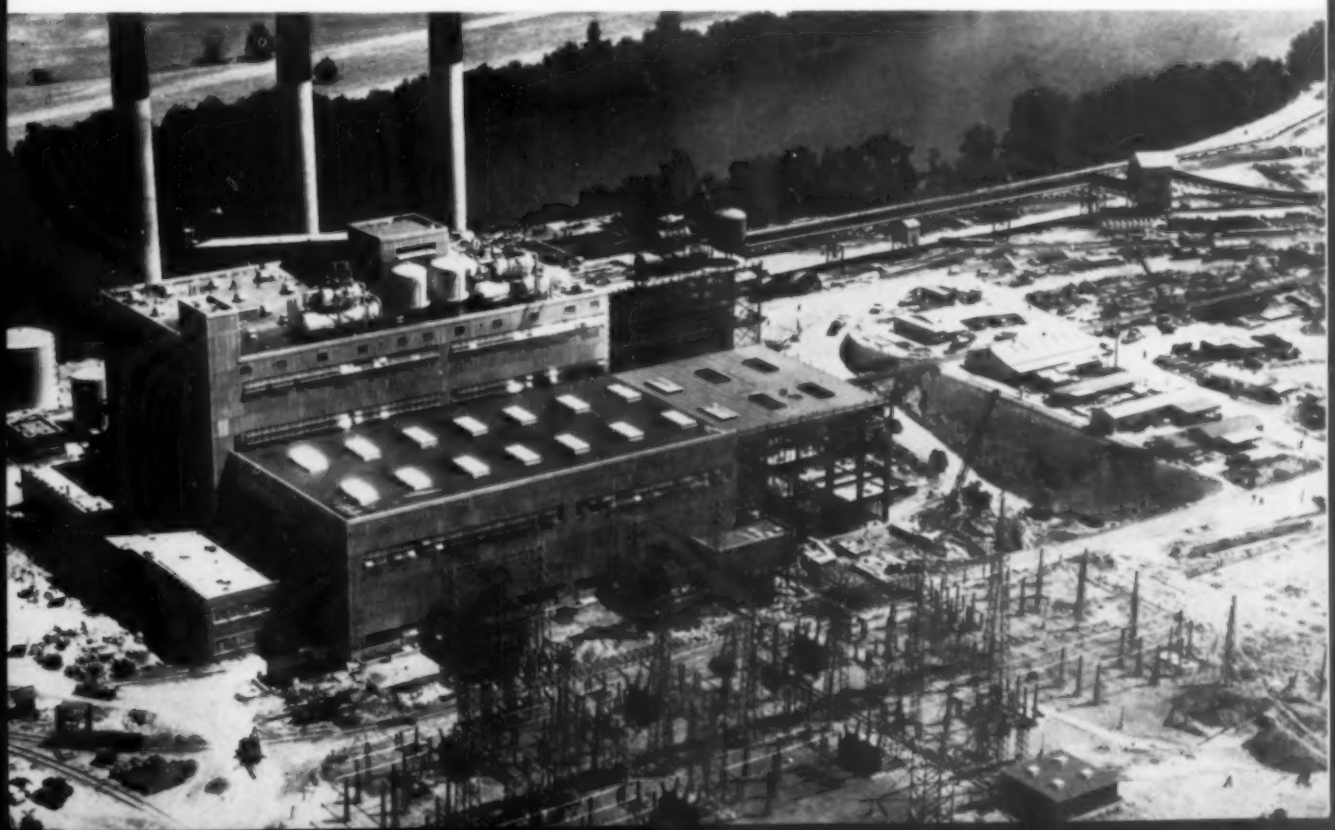


Fig. 2—Single line diagram of 230 kv bus.

Fig. 3—Aerial view of SEGCO steam plant — Substation in foreground.



equipment associated with protection and controls. The operator in the substation control room will synchronize and connect the generators to the system.

Relay Protection

The importance of the 230 kv lines justifies the maximum in relay protection. Following is a summary of the relaying system, the application having been developed by General Electric Company especially for this project.

1. Lines without mutual coupling are equipped with:
   (a) Primary Phase Protection — carrier of the directional comparison type.
   (b) Primary Ground Protection — carrier ground relay for carrier start and trip.
   (c) Back-up Phase Protection — high speed distance relays of the mho — two zone.
   (d) Back-up Ground Protection — standard directional ground relays.
   (e) Potential Supply Back-up — three phase PJC relays set above maximum swings so that it trips for adjacent faults.
   (f) Breaker Back-up — one timing relay and two cup-type overcurrent relays as selectors.
2. Lines with mutual coupling (on same right-of-way) have the same protection as above except that the carrier ground is used for carrier start *only* and an additional ground distance relay is used for start and trip.
3. Transfer tripping of the double frequency shift carrier type is employed on lines terminating in an auto-transformer without a 230 kv breaker and also on the line matched with the 230 kv starting station service transformer to insure tripping of the far end breaker for trouble in the transformer.

Metering Equipment

Metering is provided to show *delivered* power to the two operating companies and to establish *interchange* power which flows between the companies through the 230 kv bus. The metering source for delivered power is from metering accuracy bushing type current transformer in the low voltage bushings of the step-up power transformers and generator potential transformers. The source for interchange metering is from two sets of metering accuracy bushing type current transformers in oil circuit breakers between lines that supply the two companies and from 230 kv bus potential transformers.

With reference to the physical features of the substation, the ring bus is of the horizontal type with the long axis parallel to the plant. The five 15,000 mva, 1600 ampere, 230 kv oil circuit breakers employed are staggered to permit line and transformer connections to adjacent bays of the high terminal structure.

Busses

The busses are 4" Schedule 80 aluminum tube (Alloy 6061-T6) having welded bus joints and bolted equipment connections. Tap busses are supported from the main bus conductors by inverted "V" frames of 2" aluminum tube. Aluminum cables are used for connections from disconnect switches to lines, transformers, and oil circuit breakers.

The inverted vees for tap bus connections were designed with the internal angle at 60 degrees from the horizontal instead of 75 degrees as usually designed. Since these connections straddle a point of fixed support in the bus which is also the point of maximum stress, the effect is to move the welded connection toward the zero point of the moment diagram. Thus, if the welding weakens the tube the effect is not so serious. This is one example of the refinement of detail which went into the design of the bus.

Welded joints in the bus were made by the shielded arc process, using a Linde SWM-2 portable welder consisting of a wire drive and control unit and a hand guided HW-12 "SIGMA" (Shielded Inert Gas Metal Arc) torch. The drive unit feeds the wire to the torch at a controlled rate as well as con-

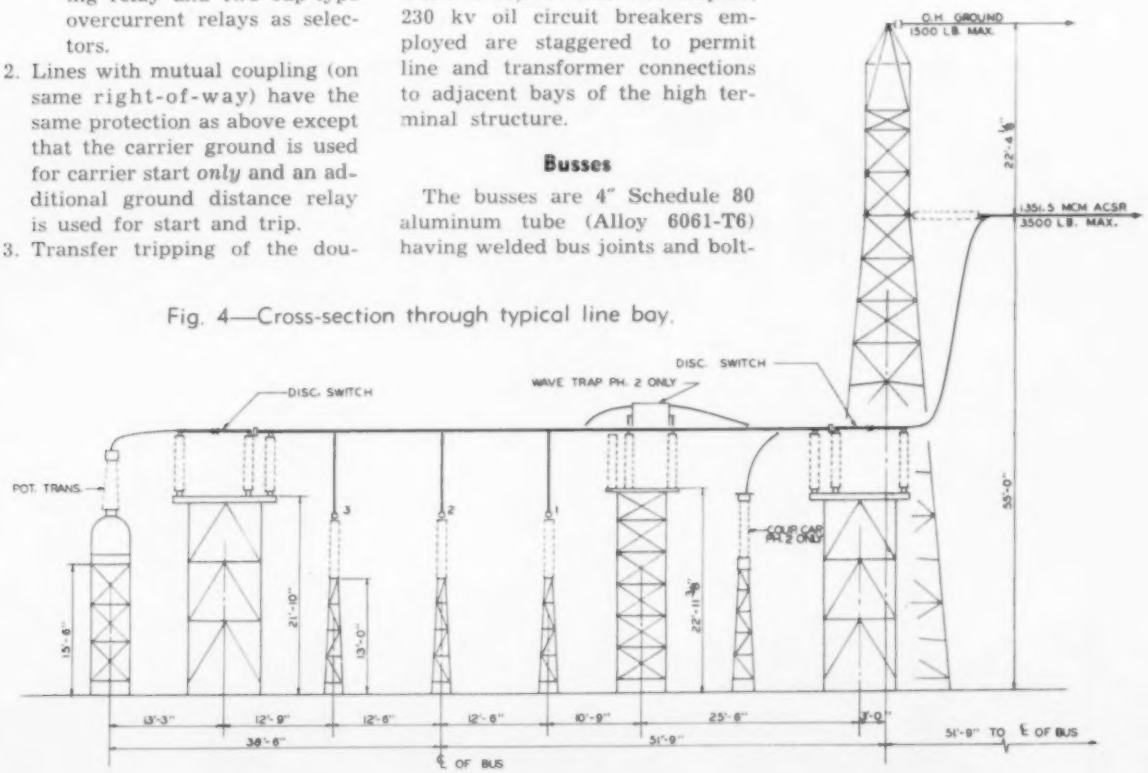


Fig. 4—Cross-section through typical line bay.

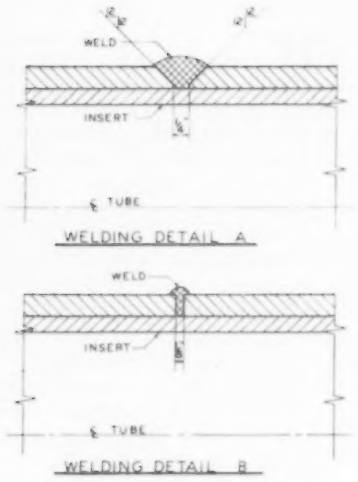


Fig. 5—Bus welding detail.

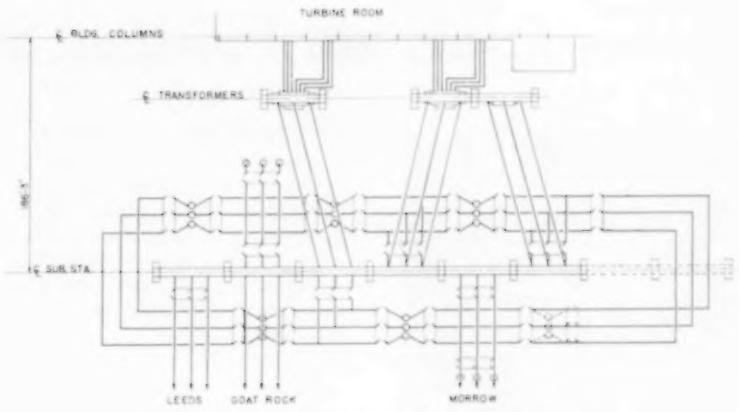


Fig. 6—General plan of 230 kv substation.

trolling flow of argon gas around the arc. Aluminum inserts were used at each joint in the bus for added strength and to serve as a back-up ring for the welding.

It was first considered necessary to bevel the tubing ends in preparation for welding but this was found by experience to be unnecessary. Figure 3 shows the bevel type joint in "Detail A" and the straight joint in "Detail B." Elimination of the bevel was quite worthwhile from the labor-saving standpoint and the resulting joint is entirely satisfactory.

Disconnect switches in the ring bus are rated 1600 amperes continuous, 70,000 amperes momentary, and the line, transformer, and potential transformer switches are 1200 amperes continuous, 60,000 amperes momentary. The switches are of the horizontal center-break design with an outboard insulator on the end connected to the rigid bus. This insulator was provided to isolate bus vibrations from the switch contacts and was a feature considered desirable by several of the switch manufacturers quoting. All switches are mounted on station post insulators.

Vibration Control

The insulation level of the bus is 900 kv basic impulse level. Mechanically the bus is designed to withstand a fault equal to the 15,000 mva interrupting capacity of the oil circuit breakers and to withstand wind velocities of 120 mph. Aeolian vibration, which appeared in the longer spans under certain wind conditions, was eliminated by loading the tubes with a length of heavy stranded aluminum conductor, using scrap ends from the line construction. This vibration is known to be a possibility in any bus of this design but cannot very well be calculated in advance. However, it is always easily controlled by loading the bus conductors. The bus is mounted on station post insulators.

Principal Equipment

The major items of equipment in the switchyard are as follows:

Switchyard Structures:
Nashville Bridge Company.

Bus Conductors:
Aluminum Company of America.

Insulators:
Lapp Insulator Company.

Connectors, etc.:
Anderson Electric Company.

Potential Transformers:
Allis-Chalmers Mfg. Company.

Oil Circuit Breakers:
General Electric Company.

Disconnect Switches:
I-T-E Circuit Breaker Company.

Control Cables:
Kerite Company and Okonite Company.

Substation Switchboard:
Wolfe & Mann Mfg. Company—Fabricators.
General Electric Co.—Relaying & Switches.
Weston Corporation—Indicating Instruments.
Leeds & Northrup—Recorders.
Esterline Angus—Recorders.
Autocall Company—Annunciators.
Fischer & Porter Co.—Millisecond Operation Recorder.
Hathaway Instr. Div. Hamilton Watch Co.—Oscillograph.

Designers:
Southern Services, Inc.

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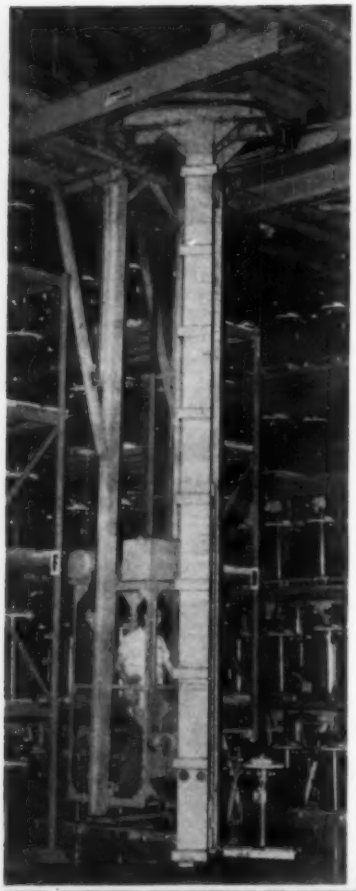
An exclusive feature report on
HOW ELECTRICAL CONTROL & DISTRIBUTION EQUIPMENT
is Specified and Purchased . . . . .

Case study report based on one of the nation's major electronic industrial and technological complexes — **Texas Instruments, Inc.** Includes: Primary substation . . . Primary distribution switchgear . . . 4-way manhole and underground duct construction . . . Monolithic duct construction . . . Cable pulling techniques . . . List of Equipment.

Stacker Cranes and Palletized Storage



Stacker crane leaving bay with transformer on forks. Note revolving frame at top, permitting extreme flexibility.

THE PURPOSE of this installation was to utilize the Athens storage facilities for centralized warehousing of transformers for the Southeastern Region, combining most of the former activities at Atlanta, Birmingham, and Charlotte under one roof and supplement their stocks.

To do this, the Athens warehouse had to be equipped so that orders could be shipped directly to customers in addition to merely handling bulk shipments to localized warehouses. All sizes of distribution transformers, from 5 kva through 333 kva have to be handled, instead of only the sizes manufactured at Athens (10 kva through 167 kva).

To accomplish the foregoing a complicated problem in warehouse logistics had to be resolved since, in addition to handling the Athens production, transformers from Sharon, Pennsylvania had to be stored and reshipped. The capacity of the system was set up for 250 transformers in and 250 out of the warehouse per 8-hour day.

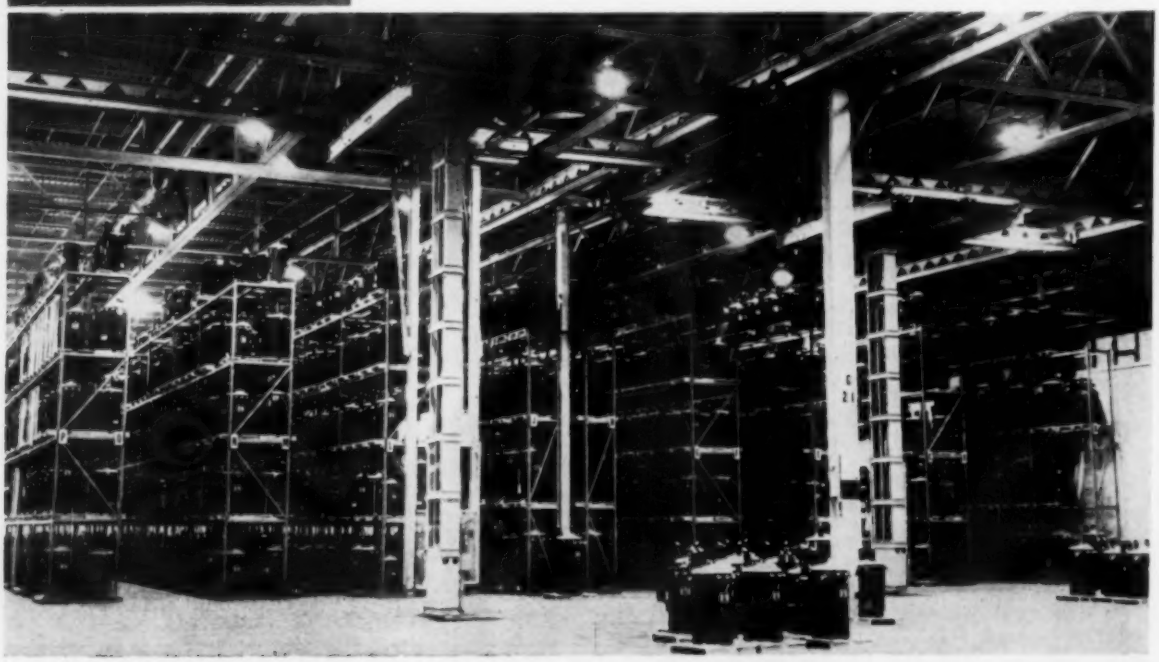
It was soon found that more capacity could be obtained if the transformers were separated by sizes. Grouping 5 through 25-kva units together required a maximum pallet depth of only 26" and a width of 25". Three rows of double-depth racks for these sizes were installed down the center of each crane bay.

Next, 37 through 100-kva sizes were grouped together. These need a maximum pallet depth of 33". These racks are installed along the outside of each crane bay, where their narrow height could be braced against building columns at the top.

Transformer sizes 167 kva and up are taken out of the system for handling by fork truck, since the requirements for these larger units are such that one row, about 100 feet long, is all that is needed.

Two of the three bays, designed as above, were equipped with

Overall view of both bays equipped with racks and stacker cranes.



stacker cranes, to facilitate operation in the narrow aisles, where fork trucks could not operate properly. The operator's cab is mounted independently from the forks, for use in the 5-foot aisles. This allows the operator to travel in the aisle center but the forks can move in and out of the racks, independently of the cab. Stacker is designed for a 2,000 lb maximum load, combining many features tried previously, but combined in one package for the first time on this job. Stacker cranes were furnished by Louden Machinery Company, a subsidiary of Mechanical Handling Systems, Inc.

A system which utilizes IBM tickets was worked out for the identification of the transformers and their specific locations. This permits random storage of the transformers and promotes two-way utilization of the stacker cranes to a maximum degree. The operators handle the IBM cards without difficulty.

Racks were designed and built by Mechanical Handling Systems, Inc., using a maximum stress of 15,000 psi in the deck beams to keep deflections to a minimum. Transformers are stacked within 3 feet of the 25-foot building trusses. Foot angles on end frames were extended to full pallet length to obtain maximum footing, and oversize holes punched in outrigger portions so that racks could be set in place, aligned and bolts pulled up tight before anchor bolts were set in floor. This was a great advantage over older and more laborious ways for setting and anchoring racks.

Although designed for three complete bays, only two were equipped with racks and stacker cranes. Actually these two are handling more than 200 transformers per day, and the equipping of the third bay is now under consideration. The results have been excellent, and it is felt that it will soon compare favorably in capacity and man power requirement with older, more complicated and much more expensive methods.

Many Hand Tools Make Work Light

PORTABLE electric hand tools are standard equipment in most assembly and fabricating plants, but the wide variety in size and power of such equipment is frequently overlooked. The accompanying photographs show Black & Decker tools doing both light and heavy work.

Curtis Mathes Mfg. Company produces television, stereo and radio equipment in plants at Dallas and Athens, Texas. Portable electric tools are used in both plants for various sub-assembly operations. In the Athens plant, 75 sets of ¼" drills and screw drivers are used at various assembly line stations. The "Scruguns" are used with screw driver blade attachments or with nut running attachments as required.

At the Fruehauf Trailer Company in Memphis, Tennessee, approximately 120 tools in the following categories are used in the manufacture of trailers: disc sanders; portable grinders; ¼", ½" and ⅝" standard drill; ½" heavy duty drills; Scrugun screw drivers; and portable shears.

Left—Scrugun with nut driving attachment for assembly of speaker units for stereo Hi Fi cabinet. Right—Drill used to run landing wheels up and down — previously done by hand.

Recommendations based on observation of results in hundreds of plants

How to Take Care of Your COOLING TOWERS

By JOHN E. KING, P.E.
The Marley Company

ENFORCED SHUT-DOWN of the cooling tower or even of a single fan cell can cause consternation in many plants. Seldom are towers installed with reserve capacity sufficient to maintain efficient cold water temperatures with any portion of the tower inoperative. This is particularly true in periods of peak demand or peak wet bulb temperature.

While almost totally unnecessary, these emergencies are common. The result is invariably the same: a crash repair project with its many attendant costs. First it is usually necessary to shut down a production unit or reduce volume; remove personnel from other jobs; wire for components to be delivered by air. Then comes overtime—hours and days — much at Sunday or holiday rates.

No one is more cognizant of the inconvenience and ultimate cost of emergency repairs than tower manufacturers. Many accept it as a part of their responsibility to draw on their accumulated experience to formulate a program that will assist operators to eliminate them. Here are practical points of a plan recommended by a tower builder; one that is functioning successfully in a wide variety of industrial plants.

Programmed Maintenance Could Have Prevented This

Scheduled Program

Like any mechanical equipment operating 24 hours per day, a cooling tower requires inspection, maintenance and ultimate replacement of parts. Efficient, low cost operation demands that these functions be given attention (in the order named) at specific intervals.

The accompanying "Inspection and Maintenance Schedule" is a carefully worked out check chart that schedules every service requirement. Examination will show that it is neither time consuming nor laborious — but it is keyed to regularity.

A casual inspection should be made once in each eight-hour shift. This "casual" inspection will give a constant check on water level and flow, will call attention to unusual sounds or vibration that are the first indications of required maintenance which can be costly if delayed.

A comprehensive control program necessitates a more thorough inspection monthly. To assist the inspector and furnish a record of his findings, a "tower record" form is available (see illustration).

All parts of the cooling tower are called out and a check block for noting the condition is used throughout the form. This Towe-Record is printed with an original, duplicate and triplicate copy, made up in sets. The original and duplicate can be routed to anyone in the organization with related responsibility and the triplicate copy kept by the inspector or operator. The reverse side of the triplicate copy provides space for a record of tower maintenance.

Inspection, to be thorough, must include structural members, distribution system, stairways, other lumber and metal parts, but paramount is the mechanical equipment. The latter is of such import as to merit individual and comprehensive treatment of each unit.

The Speed Reducer

The speed reducer is the very heart of the tower and since it is subject to greatest service wear,

DIAGNOSIS AND CORRECTION—Following this program of inspection and preventive maintenance should avoid most unexpected failures and difficulties. But if trouble does come in spite of such care, the Check-Chart presented in the May 1960 issue of S.P.I. (page 34) will serve as an excellent trouble-shooting and repair guide.

it warrants most careful attention and maintenance.

The power input shaft is held in place within the pinion cage by a set of roller bearings. The output shaft, or fan axle shaft, is at right-angles to the input shaft and it, likewise, is held in position by roller bearings. The gears within this unit can be either a single-stage reduction or a two-stage reduction set. Gears can be worm, spiral bevel, hypoid, helical or a combination of these.

Look for Wear and Correct It—Wear develops in the bearings, on the pinion shaft and on the fan axle shaft, resulting in loose shafts. Wear develops between the ring gear and pinion gear teeth and results in excessive backlash.

As a preliminary check on the conditions of the speed reducer: (1) try to move the pinion shaft up and down or sideways (indicating pinion bearing wear), (2) try to move a fan blade up and down (indicating fan shaft bearing wear) and (3) hold the fan still and rock the drive shaft back and forth (indicating backlash).

Some speed reducers have an inspection port or opening. A visual inspection of the interior can and should be made if the unit is so equipped.

If excessive movement is noted at any point, disconnect the drive shaft and see if the pinion shaft can be moved in and out of the pinion cage. Usually, the pinion shaft bearings are so set that there is a slight preload on the roller bearings; therefore, any movement of the pinion shaft indicates wear of the roller bearings. If movement is detected, the pinion cage should be removed from the unit and the bearings inspected. They should be replaced if damaged or severely worn.

The bearings on the fan axle shaft can be checked for wear by moving a fan blade up and down, and observing the movement of the fan axle shaft with reference to the top of the speed reducer casting. Relative movement of this shaft should be slight. Check the manufacturer for recommendations. Any movement beyond prescribed limits indicates wear on the fan axle shaft bearings. In the event that you find excessive movement at this point, the speed reducer should be opened and these bearings inspected.

Excessive wear of the gears can be determined by measurement of the backlash or movement of one of the shafts with the other shaft locked. The allowable backlash varies and the limits should be checked with the manufacturer. Excessive backlash indicates wearing of the teeth and bearings. Inspect and replace parts showing excessive wear.

The speed reducer must operate as a unit. Excessive wear at any one point may impose excess loads on other parts. In other words, excessive wear of the pinion shaft bearings can result in excessive loads on the gear teeth. Excessive wear on the fan axle shaft bearings will impose more load on the pinion bearings and gear teeth. Excessive wear or excessive loads on the gear teeth will in turn impose excessive loads on the various bearings. Keep the unit well adjusted and the respective loads will fall within design limitations.

Speed reducer manufacturers have complete instructions covering proper operation, maintenance and field repair for each type and model; many have pre-arranged overhaul or replacement plans. Ask their assistance in solving your problems.

Correct Lubrication Is Essential—It is easy for moisture to contaminate the lubricant in the gear case on a cooling tower. Any time that this lubricant becomes contaminated, it should be completely drained, the case flushed out with high quality flushing oil and the lubricant replaced.

The lubricant must be carried at the proper operating level. Some speed reducers are lubricated by a splash system, some by a pump system. In either case, low oil can result in damage to the unit.

INSPECTION & MAINTENANCE SCHEDULE

General Recommendations

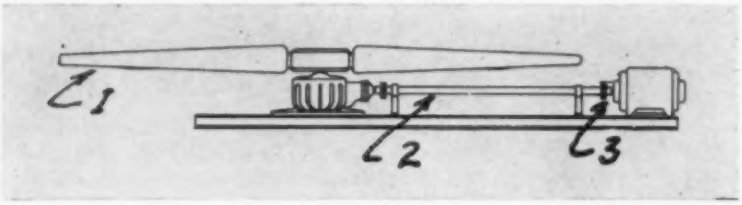
(More frequent inspection and maintenance may be desirable)

	Fan	Motor	Drive Shaft	Gearreducer	Eliminator	Wood Filling	Cold Water Basin	Distribution Basins	Control Valves	Structural Members	Casing	Float Valve	Suction Screen
1. Inspect for clogging								W					
2. Check for unusual noise or vibration	D	D	D	D						Y			
3. Inspect keys & keyways		S	S	S									
4. Make sure vents are open				M									
5. Lubricate (grease)		Q							M				
6. Check oil seals				S									
7. Check oil level				W									
8. Check oil for water & dirt				M									
9. Change oil, at least				S									
10. Check water level							D	D					
11. Check for leakage								S				S	
12. Inspect general condition	M		S	S	Y	S	Y			S	Y	Y	
13. Tighten loose bolts	S	S	S	S						Y	R		
14. Clean	R	W	R	R	R	R	S	M	M			R	W
15. Repaint	R	R	R	R							R		
16. Rebalance	R		R										
17. Completely open and close									M				

D-daily; W-weekly; M-monthly; Q-quarterly; S-semiannually; Y-yearly; R-as required

The lubricant should be inspected at least once a week for proper operating level, and once a month for contamination. The lubricant should be changed every 3,000 hours of operation or every six months, whichever occurs first. Use only the lubricant recommended by the speed reducer manufacturer.

Some motors are equipped with relief fittings that prevent over-greasing. Other motors are not so equipped and over-greasing can be injurious. All greases will deteriorate in time, depending upon bearing size, speed and temperature. Therefore, it is necessary to clean and relubricate the bearings periodically. If possible, motors should be lubricated while they are in operation. Be sure that the grease fitting and relief plugs (if any) are clean and free before and after lubricating.



Check These Points with Care

There are usually two oil seals in each speed reducer unit, one on the pinion shaft and one on the fan axle shaft. These seals must function properly in order to avoid excessive loss of lubricant.

When inspecting the unit, pay particular attention to evidence of oil leak at the point where the pinion shaft enters the pinion cage and at the point where the fan axle shaft comes through the gear case. If evidence of oil leakage is discovered, the unit should be disasssembled and the seals inspected, and replaced if required.

Electric Motors

Electric motors on cooling towers require more inspection and care than their brothers operating in a dry, warm, clean atmosphere within a building. All motor manufacturers have printed recommendations for inspection and maintenance of their motors. Contact your motor manufacturer or his sales representative and request this information. The only data needed by the motor manufacturer or his representative is on the nameplate: type, serial number, voltage, etc.

As a set of general rules to follow, be sure that the motor stays clean, correctly lubricated and reasonably dry. If a motor is not operating, dust and foreign matter can be blown in and around it. Dust inside of the motor can result in abnormally high operating temperatures.

Do not over-lubricate the motor.

In the event that it is necessary to take a motor out of service for an extended period of time, steps should be taken to prevent excessive deterioration of the inner parts of the motor during this non-operative period.

When putting a motor back into service after a considerable down-time, it is advisable to take megohmmeter readings to determine the condition of the winding insulation. Excessive moisture and deteriorated insulation will result in low megohmmeter readings. In the event of low readings, check with the nearest service shop of the motor manufacturer, unless the plant organization is familiar with drying-out procedures.

Drive Shafts

Most industrial cooling towers are so designed that the motor is placed outside the fan cylinder to keep it out of the hot, humid air stream. Such a design requires the use of a drive shaft to connect the motor to the speed reducer in the center of the fan cylinder.

Various types of drive shafts are used. All should be equipped with a flexible joint at both the motor end and the speed reducer end. Some joints do not require lubrication, others do.

As a prerequisite to satisfactory service life, the drive shaft must be kept clean, properly aligned, and lubricated if required.

The alignment of the drive shaft should be checked at least twice each year. The drive shaft, normally operating at 1750 rpm, is the major source of vibration in the mechanical equipment. Once each shift, the man who makes the "casual inspection" should pay particular attention to the condition of the drive shaft. Excessive vibration should be cause for shutting the cell down and advising the proper maintenance personnel.

Various types of material and various finishes are used in the component parts of the drive shafts. All stainless steel drive shafts are available and normally give trouble-free service from the corrosion standpoint. Drive shafts that are not stainless steel should be protected by cleaning and painting as often as required.

In most cooling towers, the drive shaft is equipped with some type of guard. In the event that it is necessary to remove these drive shaft guards for maintenance or repair purposes, they should be reinstalled before the cooling tower is put back on the line. Failure of the drive shaft, unprotected by the drive shaft guards, can result in excessive damage to the fan and speed reducer.

Fan Assembly

Most cooling tower fans have a heavy cast iron or steel hub, with the blades attached in radial sockets. The blade material varies with service requirements and manufacturer.

The "casual inspection" should always be directed to the fan in each cylinder. Any unusual noise or vibration is again sufficient cause for shutting down that cell of the cooling tower. Normally, the fan does not require much preventive maintenance. The entire assembly should be checked monthly to determine that all component parts are in good condition, and that all assembly bolts are tight. Inspect the blades for cracks at the blade attachment and at points where fatigue might be localized.

In some installations, salt deposits are built up on the surface of the fan blades. This deposit should be removed periodically, to prevent unbalance of the fan assembly.

All cooling tower fans are statically or dynamically balanced. In the event that it is necessary to replace or repair any part of a balanced fan assembly, it is necessary to recheck the operation of this assembly when it is first put back into service. An unbalanced fan assembly will result in vibration and abnormal loads being imposed on the other pieces of the mechanical equipment of the cooling tower.

Tower Lumber

Inspect the cooling tower structure as thoroughly as possible at least twice a year for indication of deterioration.

Wood deterioration can be classified in two basic types: chemical attack and fungal attack.

Chemical attack is a form of deterioration in which oxidizing agents and alkalies attack lignin (and also remove materials naturally present which are toxic to wood destroying organisms). Oxidizing agents such as chlorine can cause very serious damage. Alkalies in the concentrations normally found in cooling tower water probably have less effect on wood fibers than previously thought. Evidence of chemical attack (delignification) can probably be found, in the earliest stages of attack, in the heavily wetted and washed portion of the wood in the tower.

Fungal attack is the decomposition of wood by micro-organisms. This is nature's way of disposing of dead material, such as fallen trees and underbrush in forests, to improve the growth of living vegetation. These micro-organisms utilize wood as food. Unfortunately, they practice no discrimination and will destroy all unprotected dead wood in any form. Building lumber, of course, is also dead wood.

Fungal attack can be classed as white rot, brown rot and soft rot. White rots principally decompose all components of the wood-lignin and cellulose. Look for a spongy, stringy condition of the wood and also pockets of white or yellow fibrous material. Brown rots principally decompose the cellulose leaving the lignin more or less unaffected. The wood is reduced to a brown mass which powders easily in the fingers.

Owner _____ Date Inspected _____

Plant _____ Inspected By _____

Location _____ CONDITION OF INDIVIDUAL FAN CELLS
Item Number(s) Apply to

Owner Designation _____ Cell No. 1 _____ Cell No. 6 _____

Tower Manufacturer _____ Cell No. 2 _____ Cell No. 7 _____

Installed _____ 19____, Model No. _____ Cell No. 3 _____ Cell No. 8 _____

Tower Serves _____ Cell No. 4 _____ Cell No. 9 _____

Design Conditions _____ GPM _____ HW _____ CW _____ WB Cell No. 5 _____ Cell No. 10 _____

Water Treatment Used _____

Condition: 1-Good, 2-Repair, 3-Replace	1	2	3
1. Enwall Casing			
2. Louvers			
3. Stairway			
4. Hand Rails			
5. Walkways and Ladders			
6. Distribution System			
Wood Pipe			
Cast Iron Pipe			
Steel Pipe			
Wood Flumes			
Flow Valve			
7. Distribution Basin			
Needs Cleaning			
8. Fan Deck Floor			
9. Fan Deck Floor Supports			
10. Fan Cylinders			
Wood			
Steel			
Precast			
11. Fan Beams and Connecting Framing			
12. Motor and Speedreducer Mounts			
13. Doors and Dampers			
14. Partitions			
15. Eliminators			
16. Fill			
Water Distribution:			
Uniform ___ Not Uniform ___			
17. Structural Members			
Columns			
Girts			
Diagonals			
18. Collecting Basin			
Wood			
Concrete			
19. Sump and Screen			
20. Overflow			

Condition: 1-Good, 2-Repair, 3-Replace	1	2	3
21. Coil Shed			
22. Heat Exchanger Coils			
23. Fan			
Diameter ____ Type ____ Blades ____			
Hub			
Cover			
Tip Clearance			
Blade Pitch			
No Vibration ____ Vibration ____			
24. Speedreducer			
Quiet ____ Noisy ____			
Series ____ Ratio ____			
Oil Level			
Oil Seal Condition			
Vent			
Back Lash			
Pinion Shaft Play			
Fan Shaft End Play			
25. Driveshaft			
Type			
26. Motor			
Name Plate ____ HP ____ RPM ____			
Phase ____ Cycle ____ Volts ____			
Amperes ____ Frame ____			
Type ____ Mfr. ____			
Operating Voltage ____ Amperage ____			
HP Approx. ____			

General Comments: _____

Monthly Inspection Record Sheet

Both white and brown rots usually leave the surface intact. It is necessary to probe beneath the surface of the wood to detect its presence. It is largely found in the non-flooded zones of the tower.

Soft rot usually takes place in the flooded zone. Attack starts on the surface and progresses inward. It is identified by loosening of surface fibers, eroded surface, and loss of strength. Surface checks across the grain are frequently visible after the wood has dried.

Samples of fill and eliminator lath should be broken and the interior examined for a darkening in color. The manner in which the wood breaks should be noted — infected wood tends to break straight across the grain with little or no splintering.

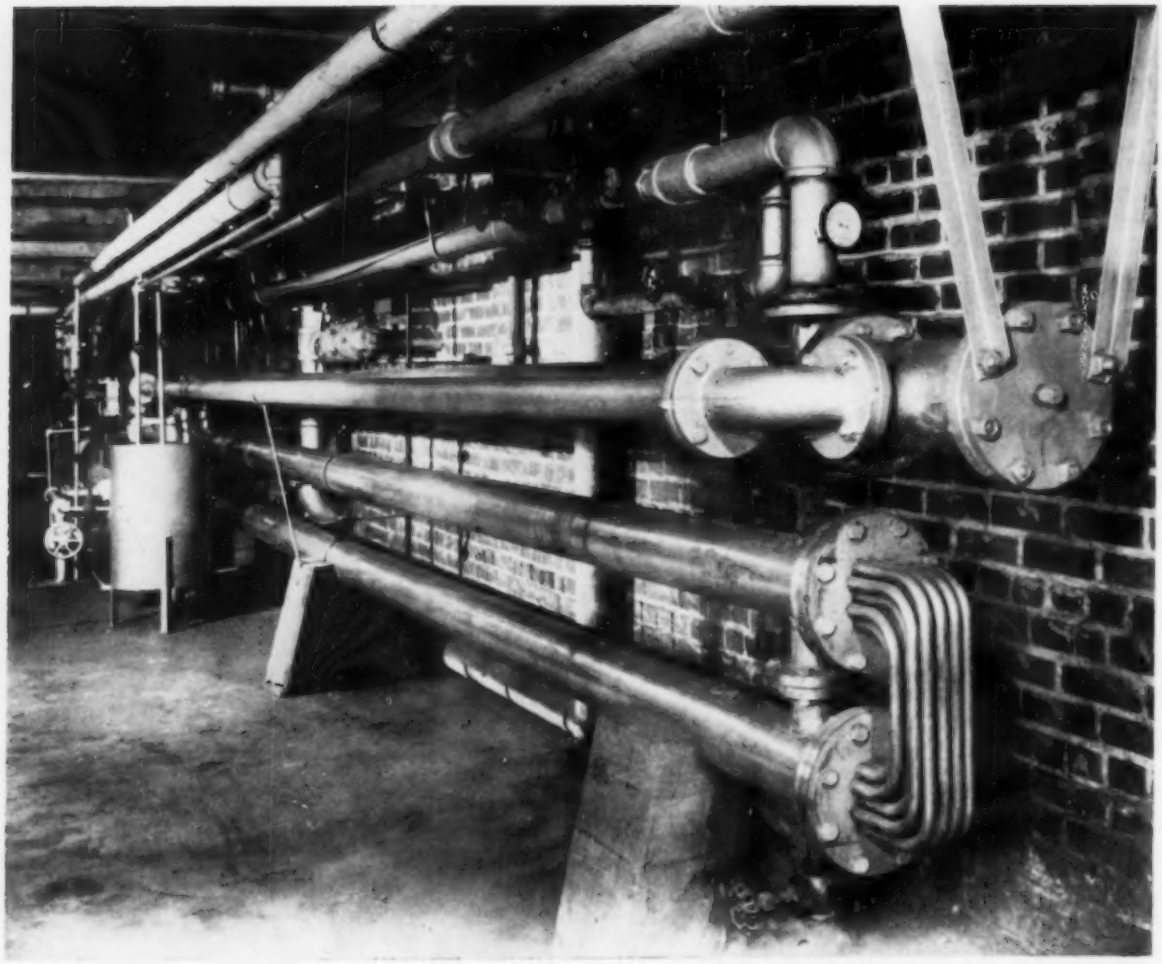
Tower Hardware

All metal parts of a cooling tower are subject to severe corrosion conditions. Special attention should be given to surface protection of these members. At least each six months, inspect the condition of the metal parts including bolts, nuts, washers, structural shapes and castings.

Structural bolts must be kept reasonably tight and in good condition. In the event of failure through corrosion or other causes, replace bolts, nuts and any other hardware as required. Any structural steel used in the cooling tower should have a good protective coating at all times.

Diagnosis and Correction

Following the above program of inspection and preventive maintenance should avoid most unexpected failures and difficulties. But if trouble does come in spite of such care, the Check-Chart presented in the May 1960 issue of S.P.I. (page 34) will serve as an excellent trouble-shooting and repair guide.



Heat exchanger serving Minnette Mills — Grover, N. C.

Heat Recovery System Saves Time and Fuel for North Carolina Mill

MINNETTE Mills, Grover, N. C., was faced with overload problems on a 300 hp coal fired boiler. Loads were erratic due to quick changes in demand involved in dyeing and bleaching of cotton and synthetic bedspreads, chenille, upholstery fabrics, and mattress tickings.

Standard procedure was to start with cold water in the vessels and heat with live steam. First, water at about 60 F was put into dye machines, and coils in the machines heated with live steam raised the temperature to 180-200 F in about 30 minutes ready for dyeing. A heat recovery system was installed to alleviate the sudden steam demand caused by the above procedure. And a new 600 hp Superior boiler was installed later to take care of plant expansion and production increases. The new boiler is gas fired with oil on stand-by basis.

The Ludell heat exchanger has sections constructed of type 304 stainless steel on both the shell and tube sides. At the designed rate, the heat recovery system is guaranteed to raise 3750 gph fresh water from 40 F to 110 F when 7500 gph

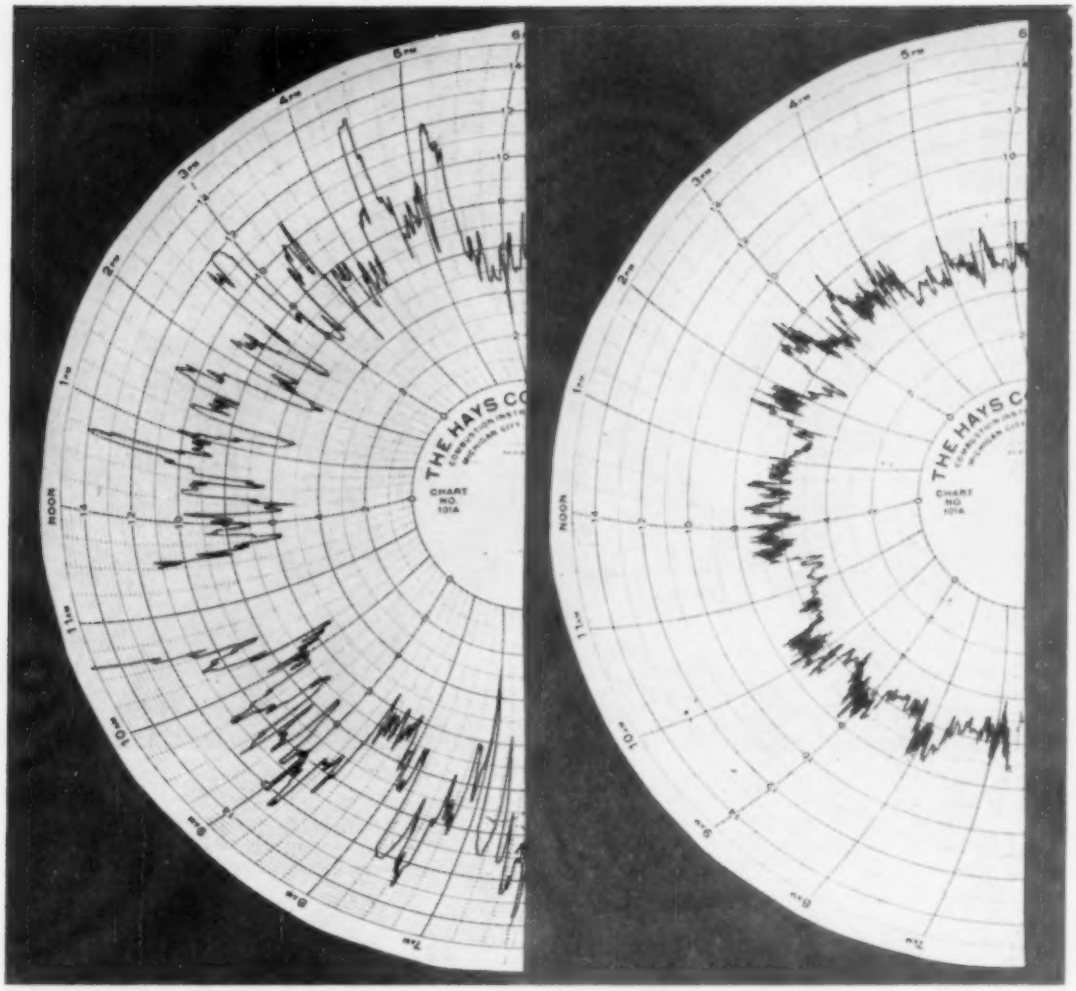


Chart at left shows extreme peaking and surging of steam load before exchangers and heaters were installed. Chart at right shows reduced steam demand and virtual elimination of peak loading tendencies on the boiler after the improvements were made.

waste water passes through at an average inlet temperature of 120 F. This system was guaranteed not to plug, stop up, or require manual cleaning.

Now water is put into the vessels at 105 F after it has been heated by waste hot water from 60 F, an increase of at least 45 F. A booster heater takes the temperature up to 180-200 F for the operation, thereby saving at least 10% of the time formerly required in processing.

The recovered heat is equivalent to adding 65 boiler horsepower, or 2,260 pounds of steam per hour in the winter when incoming water is at low temperature of 40 F. Based on average annual temperature of 60 F, the recovered heat has a value of over $6,000.00 per year at the initial design rate.

Results accomplished by the heat recovery system are:

1. Reduced average boiler load.

2. Eliminated the occasional severe peak loading or surging of the boiler.

3. Obtained enough relief of boiler load to permit 20% increase in production capacity.

4. Reduced heat-up time for the dye machines which resulted in a savings of payroll expense.

5. Reduced fuel consumption.

Deep well water is used for dyeing with no special filtration or other treatment. There is considerable lint in the waste water, but special pumps and the non-clog exchange unit take care of this condition.

Mr. C. Franklin Harry, president of Minnette, said the cost of the heat recovery system has already been amortized on the basis of fuel savings alone, and the installation delayed buying a new boiler for 18 months.

Although the present load is much in excess of the design conditions, the heat recovery system is now recovering maximum Btu from the plant's waste water. The sectional Ludell design is expansible to match future growth conditions.

Maintenance of proper balance between humidity and temperature in denim plant was difficult with old-style windows. Cotton often dried out too much, static electricity formed and matted fibers filled the air, resulting in work stoppages. This was the carding room before installation of glass blocks in window bays.

This is the carding department after installation of Suntrol glass blocks in window bays. Green filter in blocks cuts down glare, improves light diffusion. Glass block provides more effective insulation than old-style windows, improves efficiency of both heating and humidifying equipment.

Glass Block Windows Improve Production

CANTON COTTON MILLS, one of the nation's leading denim producers, found that the desired balance of humidity and heat was much easier to maintain after conventional windows and sash in the firm's two Canton, Georgia, processing plants were replaced with glass block.

Mr. C. K. Cobb, vice-president and general superintendent of the mill, which is located 40 miles north of Atlanta and employs 1,300 persons, reports that since glass block was installed in 467 window bays, both the heating and humidifying systems have been more efficient. Also there has been much greater success toward achieving a year-round average humidity condition in the No. 2 spinning room; and heat and temperature levels have been stabilized in the carding, spinning and weaving rooms and other key areas. As a result, work stoppages caused by heat and humidity imbalance have been greatly reduced.

Insulating qualities of the block, equal to that of a 12-inch concrete block wall, also have made it possible to cut plant heating costs.

Old-fashioned sash had to be painted every five years, reglazed every two to three years, and periodically replaced. The glass block requires only periodic cleaning with compressed air and a dust mop, and occasional painting of the concrete sills.

Improved appearance of the plant and greater employee comfort were two more direct benefits of the installation. Previously, conventional window panes on the east and west sides of the plants were painted with a non-glare blue paint to regulate light and heat.

Canton Cotton has replaced about 85 per cent of the old windows in its two plants with Pittsburgh Corning "Suntrol" blocks. This type of block is especially effective in direct sunlight, since a green fibrous glass screen sandwiched between the two halves of each block diminishes glare. The blocks also shut out dust and noise.

Eight-inch "Suntrol Essex" blocks, which diffuse light throughout the interior, are installed from the floor to eye level. Above eye level, "Suntrol Prism" blocks, which direct light toward the ceiling, are used. Each bay requires approximately 92 blocks. Clear glass blocks, from four to nine per bay, are set at eye level to give unobstructed view to the outside.

Black Mark Determines Route of Packages

By B. J. ARMISTEAD,
Plant Engineer
and A. C. MONTGOMERY,
Chief Electrician
Pepperell Manufacturing Co.

PEPPERELL Manufacturing Company, manufacturer of Lady Pepperell sheets, has solved a conveyor problem with a unique photoelectric system.

The center photograph shows a conveyor switch which sends cartons of cloth to either of two warehouses. The switch is operated by an air piston and a three-way solenoid valve arranged so that when the solenoid is energized, the switch is in position to send boxes on the conveyor at left. When the boxes are packed and strapped on the floor above, the operator rolls a 3" stripe of black ink about 18" long on the side of boxes that go to this conveyor. Boxes going to the other conveyor remain uninked.

If the side of the box is not blacked with ink, the light is reflected by the side of the box and picked up by a sensitive photoelectric receiver, shifting the switch to the alternate position. As the inked box will not reflect light, it will go ahead without deflection. Other photoelectric instruments and a timer constitute necessary parts of the control, such as stopping the conveyor should a jam-up occur.

A reflection type of control such as this requires that the box be against the side of the conveyor. This is accomplished by a pusher, powered by an air cylinder and solenoid valve. It is quite effective even with the heaviest cartons.

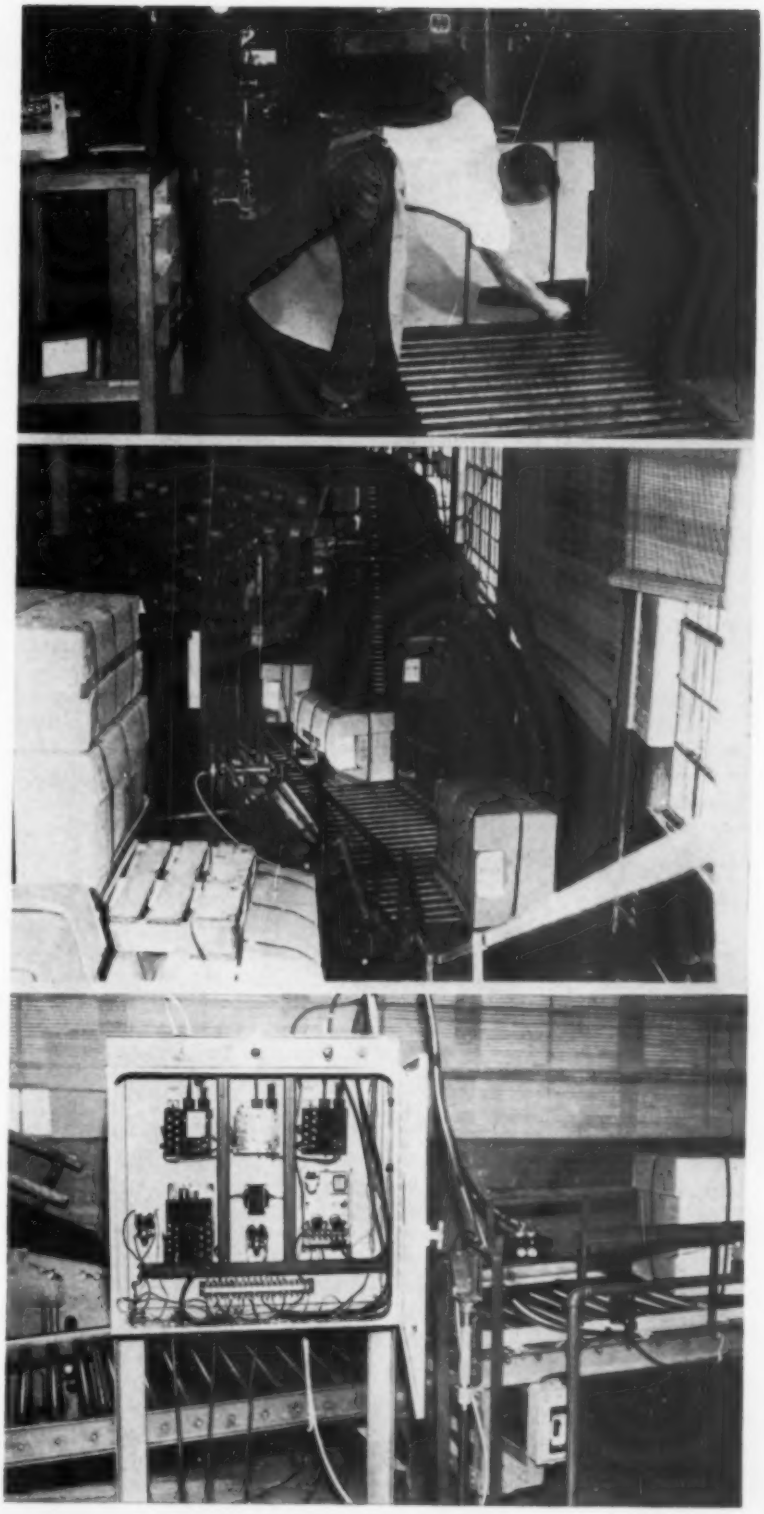


Photo at top shows black strip being applied to a box. The center view shows the switching section of the conveyor where boxes are directed to either of two warehouses. The lower view shows the Photoswitch integrated control system which sorts identical types of cartons by reflection.

Centrifugal Pump Clinic

QUESTIONS and ANSWERS
Conducted for SPI Readers

By **IGOR J. KARASSIK**
Consulting Engineer and
Manager of Planning
Harrison Division
Worthington Corporation

QUESTION . . . . . .

WE HAVE INSTALLED two steam-turbine driven single-stage 5" centrifugal chilled water pumps, each rated at 1080 gpm, 125 feet head, at 2240 rpm. We plan to operate both pumps in parallel, at speeds from about 40% to 100% by controlling the steam admission at the turbines by means of a differential-pressure impulse across the remotest coil in the chilled water distribution system.

The idea is to achieve variable chilled water flow in response to changing system demand. In most air conditioning installations, the designers call for constant flow. This we consider a waste of energy and prefer the variable speed turbine-drive pump where steam is available and can be employed economically.

The question is: If two pumps are used in parallel operation, and there occurs a slight difference in amount and pressure of steam to each turbine due to piping arrangement (125 psig nominal) causing a slight difference in speed between the two pumps, what will be the effect on the combined pump discharge? Will the pump that operates at a slightly higher speed hog the flow, or will each pump discharge according to its speed?

ANSWER . . . . . .

I do not intend to dispute your reasoning with regard to variable vs. constant flow operation of the chilled water. However, if design chilled water velocities are maintained even at part load, a more favorable evaporating temperature will exist at this load than if the flow were also reduced. Since the power consumption of the chilled water pumps is only 5 to 10% of the power consumption of the refrigerant compressor, the power savings for the compressor will be considerably more significant than the potential savings in reducing the chilled water pump power. This is the reason why in most installations the chilled water flow is maintained constant regardless of the load.

Now, as to the hydraulics involved here, unless the circumstances surrounding this particular installation are very unusual and one of the pumps operates at a very much reduced speed below the other, they may be expected to share the load within reasonable limits. Certain precautions may be necessary, however, to eliminate the danger that would arise if one of the pumps were to hog the entire load.

It is necessary first to realize that the head-capacity curves of two pumps intended to operate in parallel do not necessarily have to be exact duplicates of each other under certain circumstances.

To construct the combined head-capacity curve of two pumps operating in parallel, the individual capacities of each pump are added at various values of total head. The total flow that these two pumps will deliver into a system will correspond to the intersection of this combined head-capacity curve with the system-head curve. In turn, the capacity contributed by each individual pump will be that capacity on its own H-Q curve corresponding to the head at the intersection point mentioned above.

The curves in Fig. 1 illustrate this. I have assumed a certain head-capacity curve for pump "A" when it operates at 2240 rpm and I have further assumed that pump "B" can operate at a maximum speed of only 95% of that of pump "A" or 2128 rpm.

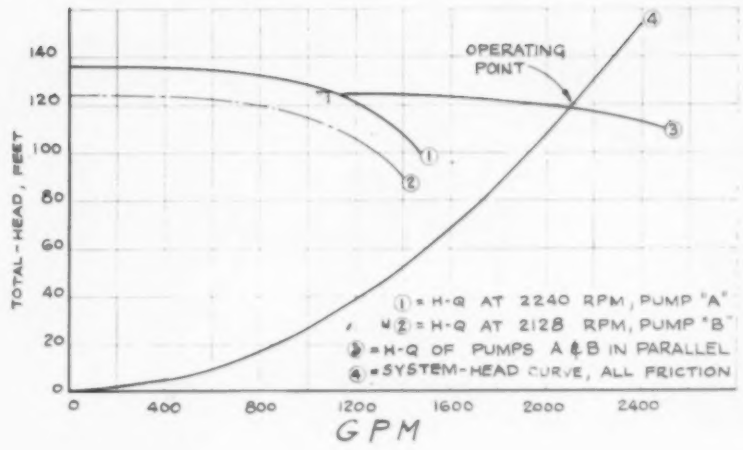
We first plot the combined head-capacity curve of pumps "A" and "B." Until pump "A" delivers 1140 gpm and develops 124 feet head, pump "B" can deliver no flow into the common header and its check valve remains closed. At lower heads, pump "B" starts delivering into the system and adding its flow to that of pump "A." Thus, the combined head-capacity curve starts at 0 capacity and 136 feet, continuing along curve (1) until the flow reaches 1140 gpm and both pumps deliver their combined flow along curve (3).

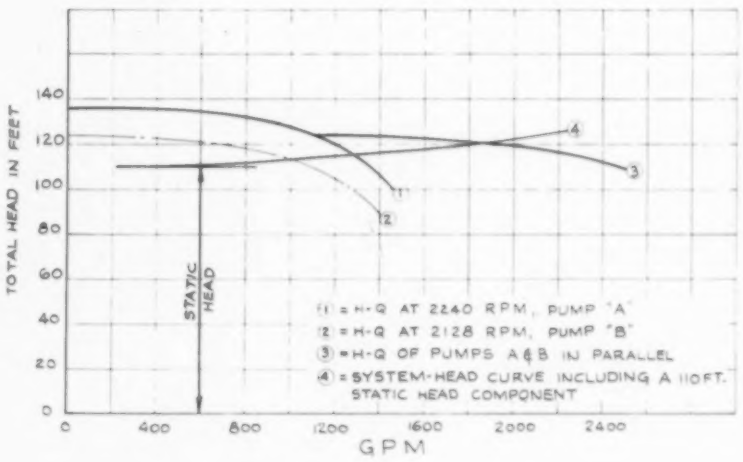
To determine what each pump will contribute, I have also assumed that the pump rating conditions were selected to correspond to the system-head curve (to simplify matters, I have neglected the probability that some margin was included) and, therefore, that the system-head curve is made up of friction only and passes through 2160 gpm (twice 1080) and 125 feet.

Under these conditions, the two

Fig. 1 Right—To construct the combined head-capacity curve for two pumps in parallel, the individual capacities of each pump are added at various total heads.

Fig. 2 Below—Performance of the same two pumps operating in a system where the static head is 110 feet.





pumps will deliver a total flow of 2100 gpm at a total head of 118 feet, which corresponds to the intersection of curves (3) and (4). You will notice that at this total head of 118 feet, pump "A" operating at 2240 rpm delivers 1260 gpm while pump "B," operating at 2128 rpm delivers only 840 gpm, making up the total of 2100 gpm.

Flow and Speed

Obviously, the difference in the flows from each pump will depend on the difference in operating speeds and on the shape of the pump curves and of the system-head curve. If the two speeds are closer together than we have assumed, the difference between the two individual flows will be less marked. In the contrary case, pump "A" will carry an even greater share of the total load. If it were desired to establish exactly the degree to which a particular speed difference will affect the distribution of flow between the two pumps, it would only be necssary to plot a family of curves at different speeds over the curves that I have drawn.

While this is not probable in the particular case analyzed here, a point can finally arrive because of a very considerable difference in speed at which one pump will hog the entire flow because the second pump does not develop sufficient head even at shut-off to discharge into the system.

Such a possibility is much more likely to occur if the system-head curve includes a very significant static head component. To illustrate this effect, I have plotted on Fig. 2 the performance of the same two pumps operating in a system where the static head is 110 feet.

In this particular case, the combined head-capacity curve of pumps "A" and "B" intersects the system-head curve at 1900 gpm. Pump "A" contributes 1200 gpm to this total and pump "B" only 700 gpm. If the speed of pump "B" were reduced further to 2070 rpm, its shut-off head would become 116 feet. Under these conditions, the head-capacity curve of pump "B" would intersect the system-head at 1280 gpm and 116 feet and pump "B" would be unable to deliver any flow.

Protection Needed

This possibility indicates that protection should be provided to avoid running one of the pumps against a closed check valve. Consequently a by-pass must be taken off between the pump discharge nozzle and the check-valve, leading somewhere back to the source of suction supply where the heat added to the water within the pump can be dissipated.

Returning to the problem of the two steam-turbine driven chilled water pumps, the problem is ameliorated when a reduction in demand for chilled water reduces the pump speed by throttling the valve which controls the admission of steam to the turbine. Under the reduced load demand conditions, the difference in steam piping arrangement will have less effect on the operating speed of the pumps.

Thus, if the two pumps and turbines are reasonable duplicates of each other, they will probably split the total capacity fairly evenly at flows lower than the maximum. You can readily test this in your installation by measuring the speed of the two pumps and their individual capacity at several reduced loads.

Atomic Developments

By JOHN F. LEE
SPI Consultant on Atomics
Broughton Professor and
Head of Mechanical Engineering Dept.
North Carolina State College

ATOMIC ENERGY knows no regional or national boundaries. Even some of the so-called backward nations are beginning to make substantial and significant contributions to the peaceful uses of atomic energy. Which of the advanced nations has the lead in the industrial uses of atomic energy is a question subject to the most heated debate. One point is abundantly clear, however. Regardless of where advances in the peaceful uses of atomic energy take place they affect everyone. Some slightly noted advance in a remote province of an obscure nation could be the cornerstone of a new industry which could have a tremendous impact on the South.

THE PURPOSE of this column, which appears regularly in *Southern Power and Industry*, is to keep an eye on world developments which could have an impact on this region while, at the same time, placing special emphasis on regional developments.

News of Oak Ridge

A symposium designed to provide an introduction to thermonuclear plasma physics was held in Gatlinburg, Tennessee, on August 22-26, 1960. The symposium was sponsored by Oak Ridge National Laboratory and the Oak Ridge Institute of Nuclear Studies, in cooperation with the United States Atomic Energy Commission.

The conference was devoted to the elementary aspects of achieving controllable release of energy in significant amounts from thermonuclear fusion reactions. The meeting centered around a course of four lectures on basic theory, with supplementary lectures on various separate experimental approaches and aspects of plasma physics of more general interest. The lectures were designed for university faculty members who have little familiarity with the subject. Various machines used in thermonuclear plasma physics were discussed.

Thirty-two scientists, noted for their work in calorimetry, spoke at the 15th Annual Calorimetry Conference at Gatlinburg, Tennessee, on September 7-10. Approximately 150 scientists from the United States and Europe attended. The conference was sponsored by Dow Chemical Company, Hofman Laboratories, Arthur D. Little, Inc., Westinghouse, AEC and ORNL. General chairman was Dr. J. P. McCullough, Bureau of Mines, Department of Interior at Bartlesville, Oklahoma.

The conference was concerned primarily with experimental investigations of systems in which energy transformations occur. Purpose of the program was to promote new and improved studies by informal interchange of ideas, exchange of experimental techniques, and informal discussion of mutual problems.

The meeting was devoted to all phases of calorimetry, ranging from very low temperature to high temperature specific heat determinations, stored energy of solids, microcalorimetry, precision bomb and reaction calorimetry, solution calorimetry, magnetic effects and thermal measurements, and other fields where thermal effects play an important role. In addition, the conference covered subjects such as temperature measurements and scales, standard calorimetric samples, promotion of better instrumentation, and publication policies related to thermodynamic data.

More than 138,000 shipments of radioisotopes have been made from Oak Ridge National Laboratory in the fourteen-year period since the first shipment of one millicurie of carbon-14 on August 2, 1946, to the Barnard Free Skin and Cancer Hospital in St. Louis, Missouri.

Expanding interests in the uses of radioisotopes have resulted in increased industrial efforts to develop new processes and products, and are contributing to significant progress in all fields of human endeavor. Shipments from ORNL during the past fourteen years have increased in numbers and size and have been utilized throughout the world for teletherapy studies; radiography and radiation damage work in industry; tagging chemical compounds for mechanical-wear studies, and for radiation chemistry research. From interstitial implants for cancer treatment, to the sterilization of the screw-worm flies for reduction of their population, the production and use of radioisotopes in associated industries are saving hundreds of thousands of dollars annually.

The Commission's radioisotope operation at ORNL has fostered and introduced a new phase of research and industry. The Laboratory's 1,100 shipments per month to an estimated 2,700 users throughout the United States and 57 foreign countries have made it the center of the radioisotope field.

The increase in cobalt-60 production and distribution is a good example of the growth of ORNL's over-all radioisotope program. This is shown in the fact that 5800 curies were shipped in the first five years, while more than 100,000 curies were shipped in 1959 alone. The growth in the production of other radioisotopes shipped from the Laboratory has been equally phenomenal.

Outstanding authorities on various aspects of reactor construction, operation and education led an international conference on university nuclear reactors, held at Gatlinburg, Tennessee, on August 17-19. Delegates from Belgium, Canada, France, Israel, Japan and the United Kingdom, attended in addition to the more than 150 representatives of forty United States colleges and universities.

The meeting was sponsored by Oak Ridge National Laboratory, the Oak Ridge Institute of Nuclear Studies, and the Oak Ridge Section

Becomes President of State University of New York

PROF. JOHN F. LEE, head of the Department of Mechanical Engineering at North Carolina State College, will soon become president of the State University of New York on Long Island.

Professor Lee has served on the State College faculty for the past eight years and has been head of the college's Department of Mechanical Engineering since 1958.

The State University of New York on Long Island, now temporarily located at Oyster Bay, is building a $250,000,000 permanent campus at Stony Brook, Long Island. Chairman of its board of trustees is David Sarnoff, chairman of the board of RCA. The university, which Professor Lee will head, embraces a Graduate College as well as Colleges of Science and Mathematics, Arts and Letters, Engineering, and associated divisions.

An internationally-known educator, Professor Lee gave the Curie Lectures at the University of Paris last spring. He was the first engineer and the sixth American to receive that honor. In North Carolina, he has been closely affiliated with the N. C. Research Triangle and has been acting in Governor Hodges' program to attract industry to the State.

Professor Lee is a member of the American Society of Mechanical Engineers, American Society for Engineering Education, Harvard Engineering Society, Sigma Xi, Pi Tau Sigma, Tau Beta Pi, American Association for the Advancement of Science, American Standards Association, and the American Rocket Society.

Professor Lee has authored a great many technical publications and has received world-wide acclaim for his contributions to the science of statistical thermodynamics. In 1954 he became adviser to the editors of *Southern Power and Industry* in the field of Atomics. Since that date, his regular columns in SPI have included over fifty educational type articles that have helped Southern engineers to keep informed on the rapidly developing field of nucleonics.

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of the American Nuclear Society, in cooperation with the U. S. Atomic Energy Commission. The conference was intended to benefit colleges and universities that have yet to undertake reactor programs, as well as those institutions that now have operating reactors on their campuses.

One of the principal speakers was Dr. Jean Debiesse, director of France's atomic energy installation at Saclay, who discussed the present state of educational reactors in Europe. Other speakers included representatives of Oak Ridge National Laboratory, Argonne National Laboratory, the National Science Foundation, the General Nuclear Engineering Corporation, Associated Midwest Universities, the Oak Ridge Institute of Nuclear Studies, the U. S. Atomic Energy Commission, and a number of universities that operate various types of reactors.

Fuel Cells

An experimental fuel cell which will convert *unpurified air* and ordinary hydrogen gas directly into electric power was demonstrated before the annual meeting of stockholders of Ionics Incorporated, Cambridge, Mass. The Ionics' development involves acid-type cells which can make use of normal atmospheric air. The atmosphere contains carbon dioxide gas which contaminates alkaline fuel cells and therefore requires purification before it can be used.

Keys to the new process were specified as a combination of a fuel electrode and an ionics membrane similar to those used in water desalting plants; a platinum-coated electrode known by the trade name Tirrelloy; and a bromine-bromide acid solution in the cell, which facilitates the utilization of air to produce power.

Other fuels in addition to hydrogen are under investigation. Direct current electric power produced by the fuel cell would be useful to the electroplating industry for depositing metals such as zinc, cadmium, copper, nickel and chromium. It would also be of interest for a wide variety of electrochemical processes including production of aluminum metal and basic chemicals such as caustic and chlorine.

Florida Reactor Project

A research and development program related to the proposed gas-cooled prototype nuclear power plant of the East Central Nuclear Group and Florida West Coast Nuclear Group has been reoriented towards the early development of beryllium clad fuel elements.

The objective of the reoriented research and development program is to resolve the technical problems involved in the use of beryllium as cladding for fuel elements before a decision is made to construct the prototype plant. Previous research emphasized development of fuel elements clad with stainless steel for the first core loading.

The major advantage of the gas-cooled, heavy water - moderated reactor concept is its ability to operate on natural uranium which requires the use of beryllium or other low neutron-absorbing cladding material. The new research program is expected to delay completion of the plant, originally scheduled for July 1963, by from

(*Continued on page* 69)

MANAGEMENT CLINIC

Conducted by ROBERT H. EMERICK, North Charleston, S. C.

Promoting Helpers to Journeyman Status

Question . . . . . .

IS THERE any generally recognized procedure for promoting craft helpers to journeyman status? We have a grievance from a Millwright Helper who was not promoted after 3 years in that grade when a journeyman vacancy occurred.

He bases his grievance on the fact that previously, on occasion, we have promoted helpers with less than 3 years experience. However, we also have promoted helpers with between 3 and 4 years of experience, because we consider that time alone doesn't qualify a man for the higher grade; he has to be competent in his trade also.

We want to avoid this kind of grievance in the future.

Suggestions . . . . . .

THE HELPER SITUATION, unlike apprenticeship programs, is confused by the fact that many helpers don't want to be promoted to journeyman status. They like being helpers because it relieves them of responsibility, and usually the pay of a competent helper is very good, related to the journeyman rate.

Despite this factor, the establishment of a helper rating procedure can be quite effective in "pulling the teeth" of a grievance such as the one described. It is effective because, at any given time, the record will show which helpers are qualified for promotion and which ones aren't.

In establishing such a rating system, the Richards Formula as used for evaluating apprentices offers a sound point of departure. The formula considers such important factors as: (a) manipulative skill; (b) technical knowledge; (c) related information; (d) craft judgment; (e) morale of employee.

To each of these factors is assigned a numerical value, and the summation of these values at each rating period, indicates the progress made toward qualification.

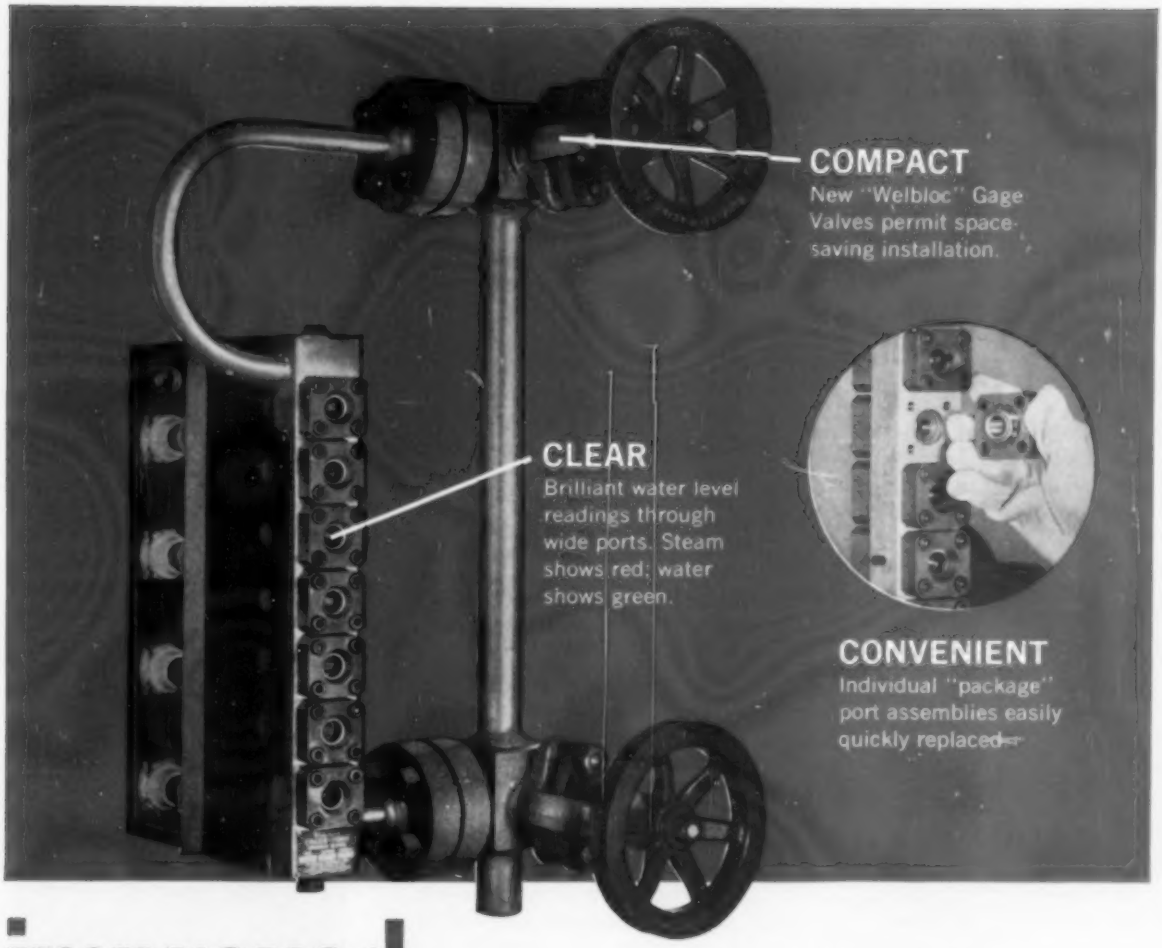
Here are some figures suggested for use as numerical values, although each plant may prefer its own selection of values: 95-100, exceptional; 85-94, superior; 70-84, average; 65-69, passing. Below 65, failure.

With 65 as the lowest passing mark, and assuming that each individual helper is rated at 6 month intervals over a par qualification time of 4 years, a total of $8 \times 65 = 520$ points needed to qualify in each factor.

Obviously a fast learner who scores 95 in a factor at each rating will make his points in $520/95 = 5.47$ rating periods, or 2 years and 9 months approximately. For the average individual, making 80 at a rating, the qualification time in that subject can be calculated as 3 years and 3 months.

The transfer of high points from one factor to another, in order to make up deficiencies, is not permitted. A helper must achieve his 520 points in *each* factor to qualify for promotion, since a high score in morale, for example, is not an acceptable substitute for manipulative skill.

This rule is designed to guard against premature promotion as the result of a brilliant performance in only limited areas of the qualification program.


COMPACT
New "Welbloc" Gage Valves permit space-saving installation.
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Brilliant water level readings through wide ports. Steam shows red; water shows green.
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Individual "package" port assemblies easily quickly replaced

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2,000,000 Tons of Coal Annually

A GIANT industrial complex which represents a capital investment of more than a quarter billion dollars has arisen in one 11-mile section of the Ohio River Valley south of Wheeling, W. Va. This vast undertaking involves the mining of coal, generating of electric power, and the production and fabrication of aluminum.

Electricity for this fuel-to-power-to-metal manufacturing complex is supplied by three 250,000 kw generators at the $91-million Kammer Plant at Captina, W. Va. Coal is supplied by Consolidation Coal Company's nearby Ireland Mine preparation plant.

Steam for the plant is provided by three boilers with a design pressure of 2,000 psi and a temperature of 1050 F. The combined steam output totals about 4,500,000 lb per hour. Five cyclone furnaces serve each boiler.

The power plant was constructed by Booth & Flinn, Pittsburgh. Link-Belt Company engineered and constructed the structural steel and machinery parts of the coal handling system.

The coal handling system conveys the coal:

- from the sampling and transfer house to the storage surge pile or to a dozer pile by means of 48-in. belt conveyors at 1650 tph;
- from part of the storage pile back to the sampling and transfer house by 42-in. belt conveyor at 1340 tph;
- from the surge pile to the crusher house, from crusher house to transfer tower above the power plant, and from the transfer tower to bunkers above the boilers by means of two parallel 24-in. belt conveyor systems at 690 tph.

Up to 700,000 tons of coal can be stored in the outdoor area.

A unique feature of this 675,000-kw power plant is the boiler's design which permits it to burn either coal or char. The latter fuel is an end by-product of low temperature distillation of coal.

1

Coal Needs

Coal is consumed at the rate of about 2 million tons annually. At the Kammer Plant it takes only .8 lb of coal to generate one kwh—9100 Btu required per net kwh.

Coal that is routed from the transfer house directly to the power plant primary system is chuted to a 540-ft inclined belt conveyor running out to a lowering well, 110 ft high. (See Fig. 1)

Lowering Well

This lowering well is an interesting feature of the Kammer Plant. Its purpose is to prevent windage loss and dusting. Cylinder-shaped and resembling a silo, the well has a 7-ft inside diameter and is fabricated of steel plate construction supported by four tapered wing braces on a concrete foundation. Coal can be discharged at any of seven levels through 14 openings 2½-ft square.

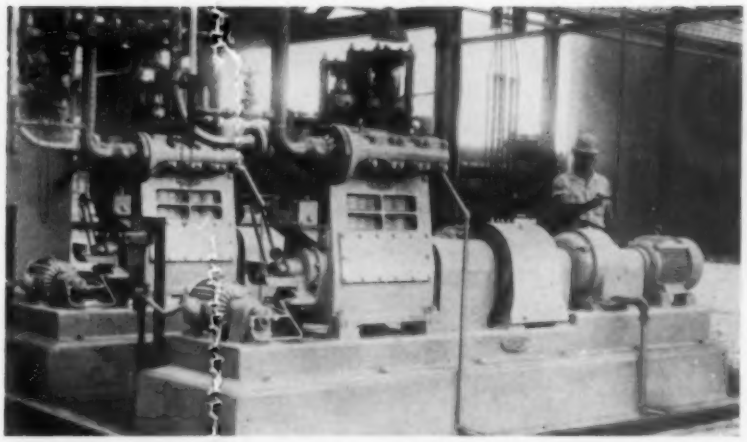
As the coal discharges through the well openings and forms the surge pile, tractors can distribute, level and compact it.

Coal Stockpiling

The coal can be dispersed to the standby stockpile in order to keep the Ireland Mine preparation plant in operation should the primary conveyor system to the generating station be shut down for any reason.

The storage pile is stacked by a revolving boom stacker using a 48-in. wide belt conveyor which can rotate in an 80-degree arc and is capable of handling 1,650 tons per hour. A telescoping chute at the discharge end reduces dusting. The chute, controlled by limit switches, rises automatically as the pile builds up. (See Fig. 2)

2



Alloy Parts Help Tame Caustic Soda

PUMPING 50 per cent caustic soda solution continuously for over 18 months without breakdown is a severe requirement for reciprocating pumps. That's what Dow Chemical Company expected, however, of two caustic soda pumps installed in 1958 at its Louisiana Division in Plaquemine, Louisiana.

At this plant Dow produces caustic soda and a wide variety of other basic and intermediate chemicals. At the caustic soda unit, the two reciprocating pumps transfer the corrosive caustic at 400 psi from storage tanks to process.

Because caustic soda is highly corrosive, ordinary materials of construction fail rapidly. Therefore the pump manufacturer, Aldrich Pump Company, supplied the triplex pumps with nickel alloy parts where the caustic soda is contacted. The pumps' plungers and valve plates are made of "K" Monel, valve seats of "S" Monel, and the fluid ends are 3½ per cent nickel steel.

According to Dow, experience with pumping this corrosive fluid has not revealed any sign of pump failure. Only routine maintenance has been needed, such as oil changes and lubrication.

Pump Control Reduces Down Time

A PUMP CONTROL based on the Foxboro Magnetic Flow Meter has reduced down time for pump and piping repairs in the production of phosphate rock at International Minerals & Chemical Corporation's plant at Noralyn, Florida.

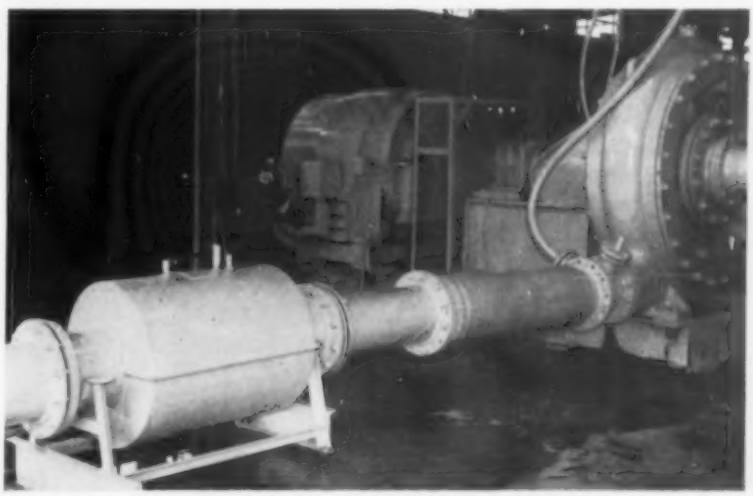
Previous to the installation, the pump, which transfers the sand-and-water residue from the flotation process to a disposal area, needed watching continually because failure of this critical unit would shut down the entire plant. Yet manual control was inadequate to care for the variations in slurry density resulting from changes in plant load. Some form of automatic control to provide a constant 5000 gpm was clearly indicated.

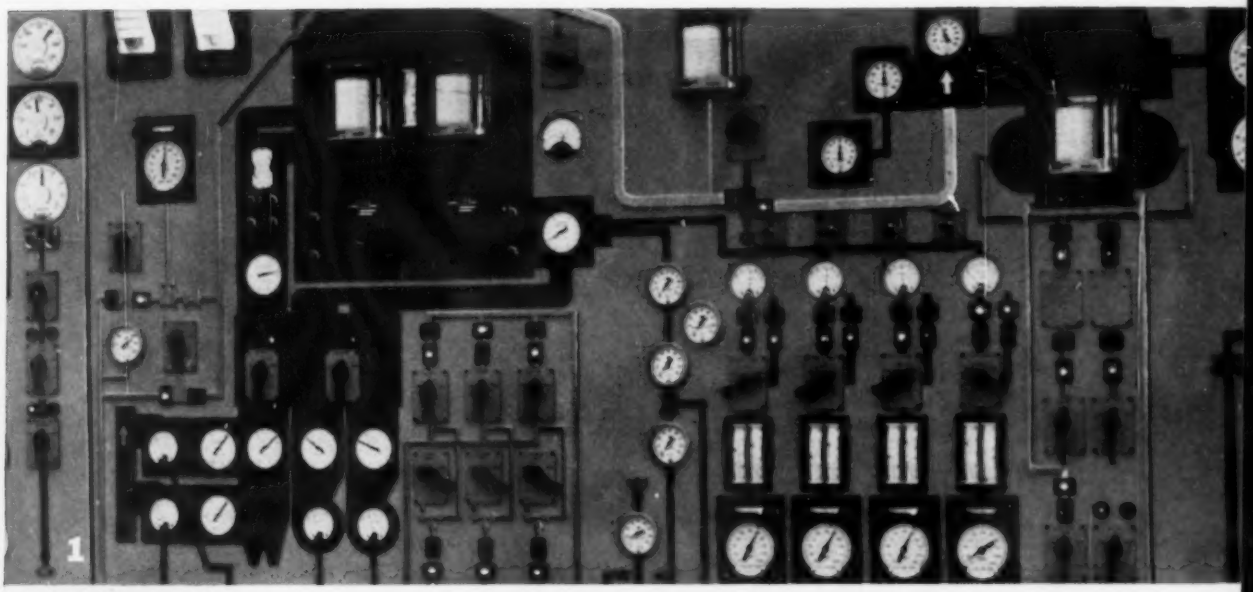
International Mineral's engineers used a 12-inch Foxboro Magnetic Flow Meter shown at left in the photograph. This is essentially an unobstructed pipe section with liner to resist erosion and flush mounted electrodes to sense the voltage generated by flow through the magnetic field in the pipe.

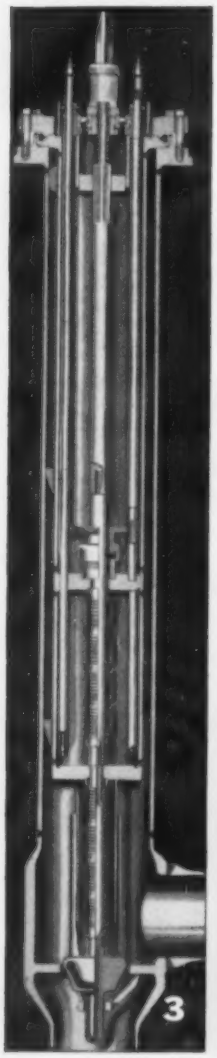
The signal from the electrodes is received by a Foxboro Dynalog Recorder-Controller (not visable in photo) which is equipped with Rotax electrical contacts.

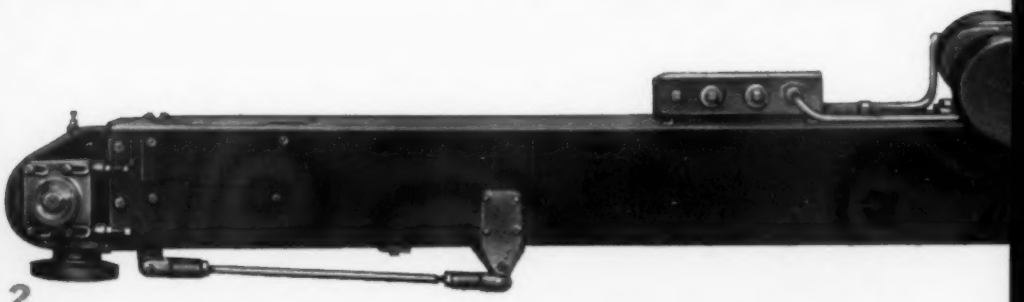
If flow from the pump falls below the desired gpm, the contacts mate, energizing a rotating cam switch which increases pump motor speed. An alarm is triggered if flow decreases beyond control. If flow increases above normal, the controller reduces the motor speed commensurately.

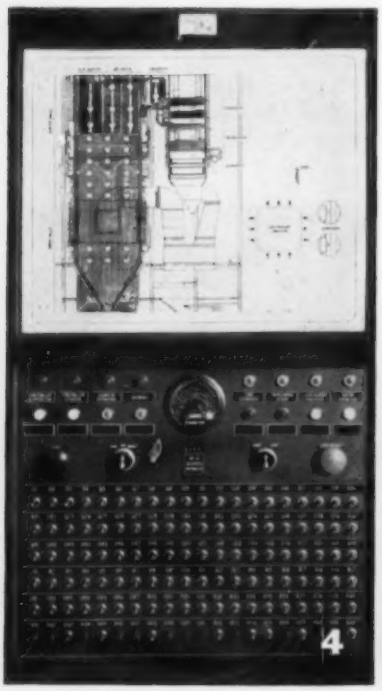
Now the flow is automatically controlled in a highly satisfactory manner. The meter has been in 24-hour-a-day service for three years with only one liner change (a preventive measure when plant was shut down). The meter paid for itself in four months by reducing down time for pump and pipe repairs, and unattended operation is providing better use of existing manpower.

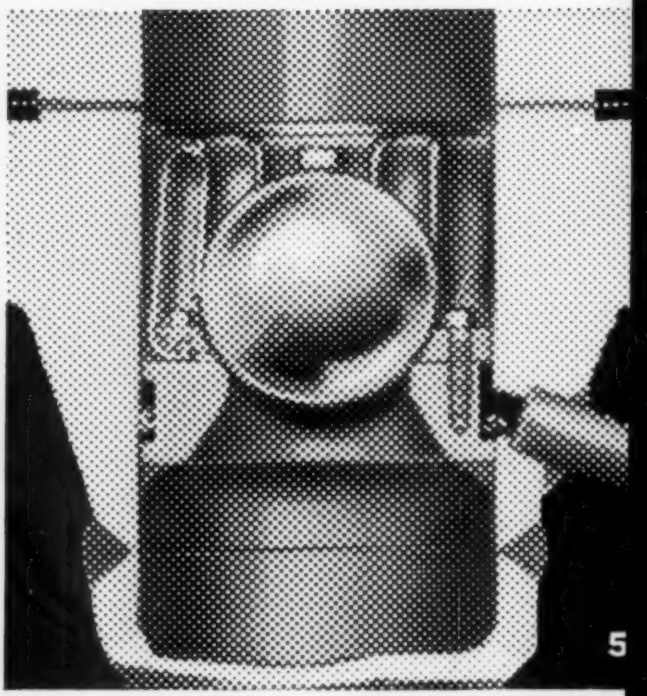


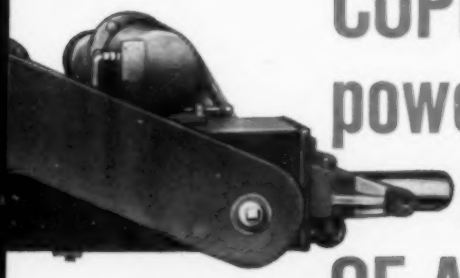












COPES-VULCAN increases power plant efficiency with NEW CONCEPTS OF AUTOMATIC CONTROLS

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BLAW-KNOX

Ceramic Tile Cooling Tower for Texas Plant

DISSATISFIED with the cooling towers previously used and seeking new methods to facilitate the handling of water up to 190 F, the Waco, Texas, branch of the General Tire and Rubber Company in 1956 turned to ceramic cooling towers. The installation was by the Ceramic Cooling Tower Division of Acme Brick Company of Fort Worth, Texas.

Don Nickum, Production Manager for the Waco plant, is enthusiastic about the ceramic installation. He said: "Since our installation of a ceramic cooling tower four years ago, a more satisfactory operation has evolved. Although the initial investment was higher than for conventional cooling towers, more efficient service and freedom from maintenance and operational problems have exceeded our expectations."

The tower allows passage of 600 gallons of water per minute, 300 gallons in each of the two cells. The tower sets on the ground and no special excavation was made at the site. The structure is 28' x 14'4" and is constructed of standard building tile. Inside cell walls are 13 ft square and there is an 8" partition wall of the same tile between the two cells. The 600 gpm tower will accommodate 190 F (hot water); 88 F (cold water) and 78 F (wet bulb) temperatures.

The roof deck is a pre-cast section of heavily reinforced lightweight concrete. The tower contains two 10 ft diameter tile fan stacks, constructed of 8 x 5 x 4" tile, laid up in a circle.

Each stack contains a 10 ft diameter fan with adequate space allotment above the fans so that air may be better guided to prevent recirculation.

Exterior walls are sealed against stain and deterioration from within by sheets of durable, long-life fiberglass Polyester resin reinforced with fiberglass and securely anchored to the interior walls. These 6' x 8' fiberglass sections are nailed to the walls with special cadmium-plated nails. The 2" overlap and nail holes are then covered with patches of fiberglass.

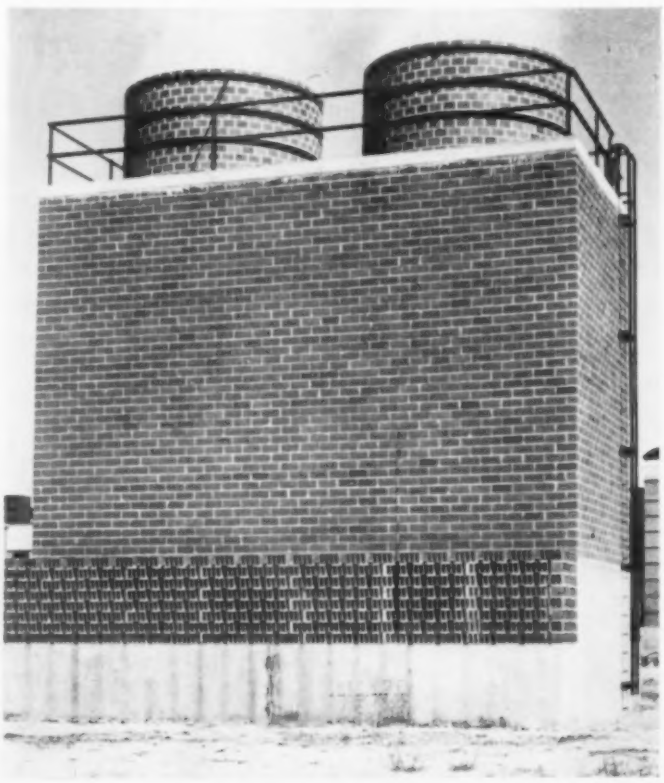
The tower is completely waterproof and prevents erosion or capillary leakage which could stain the tower outside wall surfaces, or might weaken the mortar joints if water of low pH were used.

A 6" header pipe runs up the middle of each cell and distributes the supply water through successively smaller pipes, thus maintaining a constant and controlled water velocity to each spray nozzle. The nozzles spray water downward through the tower, mixing with air which comes in at the tower base. The Perma-Grid tile fill on which the water is distributed inside the tower is guaranteed for a 20 year minimum life. All main piping in the tower is of cast iron, a longer lasting material in this service than steel.

The fill material, a specially designed cellular tile, is placed in a predetermined vertical pattern, providing the extensive areas of wetter surface necessary for efficient air liquid contact and heat exchange. The Perma-Grid tile, or fill material, is a hard-burned, highly vitrified tile especially engineered for Acme cooling tower installations. The fill is supported by cast iron lintels.

The advantages of a ceramic cooling tower are many. A ceramic tower fill will not warp or change pattern; moisture carry-over is prevented by a special system of fiberglass eliminators; and the ceramic structure is fireproof. The minimum life expectancy of a ceramic tower is 50 years.

This 600 gpm ceramic cooling tower was installed in 1956 at the Waco, Texas, plant of the General Tire and Rubber Company by the Ceramic Cooling Tower Division of the Acme Brick Company.



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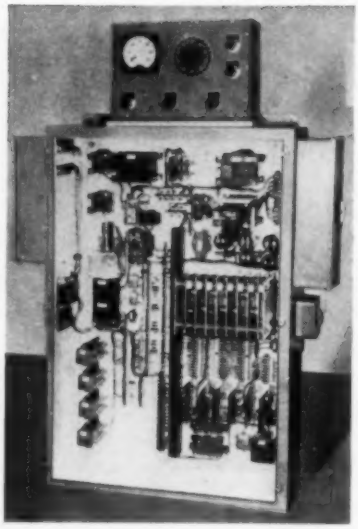
DACA Governor Control



The control for this governor is contained in this single small cabinet. The operator's control station is mounted on top the cabinet here, but can be located remotely anywhere in the mill. All the components are static and have the advantages of static units; long life, no moving parts, low maintenance and great reliability.

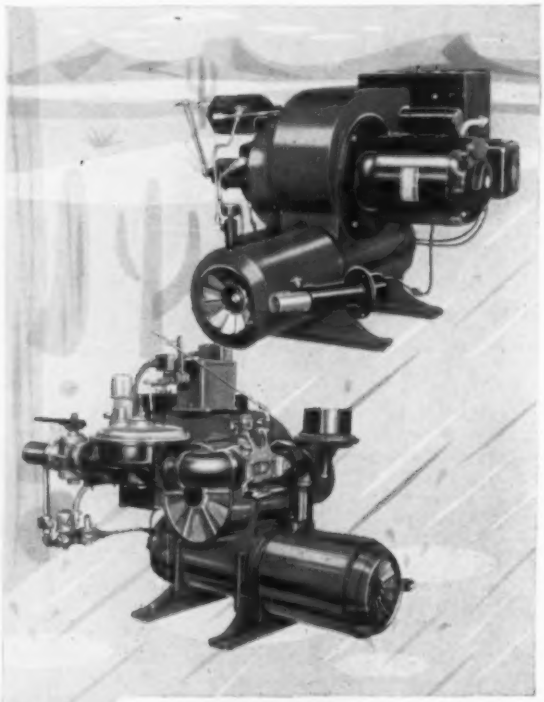
An electrical governing system of this sort is free from many of the problems which afflict a hydraulic system. As noted in the text, there is no deterioration in governor gain at low speeds. As long as the digital pulse system can count pulses, it can cause a change in the steam valve setting. This means that control can be exerted by DACA accurately almost to zero speed.

A SOUTHERN paper mill has installed a Westinghouse DACA governor control on a paper machine drive turbine. This new governor accurately maintains .1 per cent of set speed for any setting within a 10 to 1 speed range. This means that for a paper machine rated at 2,000 feet per minute DACA can hold any set operating speed with plus or minus one-tenth of 1 per cent. If this machine were operating at 1,000 feet per minute it would be held at plus or minus one foot per minute.

DACA stands for Digital Analog Control Apparatus. With DACA there is no deterioration in governor gain that is experienced at low speed with conventional governors. DACA is an advance over previous governors in two ways — closer control — and semi-automatic operation.

This new governor compares a feedback signal with a reference signal. A reluctance pickup at the turbine generates this feedback signal, a digital pulse, proportionate to the speed of the turbine. Since the signal is digital in nature there is freedom from drift. The reference signal is generated by a crystal oscillator, which is extremely accurate. These two signals are compared by DACA. A difference in signals between the feedback and reference is corrected by a signal from the comparitor, which initiates a torque motor, which brings the turbine speed back into line.

The control provides this paper manufacturer with the precise speed control necessary.



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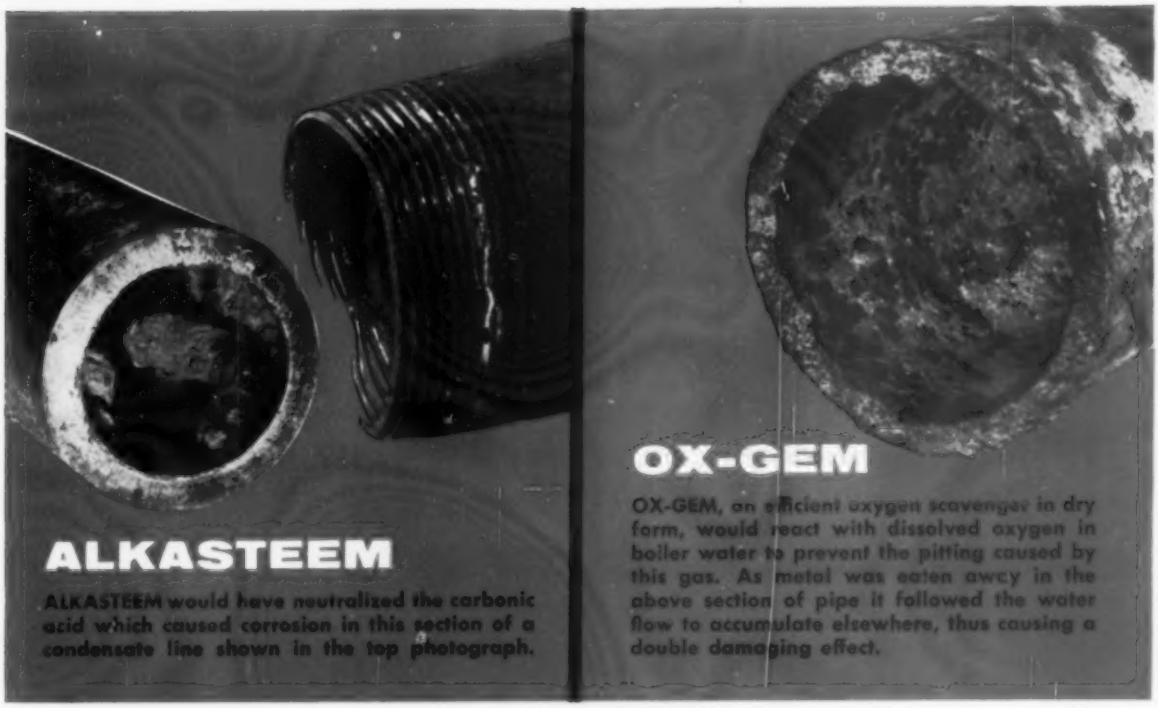
prevent corrosion in boilers and return lines



ALKASTEEM

ALKASTEEM would have neutralized the carbonic acid which caused corrosion in this section of a condensate line shown in the top photograph.

OX-GEM

OX-GEM, an efficient oxygen scavenger in dry form, would react with dissolved oxygen in boiler water to prevent the pitting caused by this gas. As metal was eaten away in the above section of pipe it followed the water flow to accumulate elsewhere, thus causing a double damaging effect.

save expensive replacements

You can stop the corrosion in boilers, steam lines, steam traps, valves, unit heaters and return condensate lines. Corrosion is frequently caused by dissolved gases such as carbon dioxide and oxygen. When these gases occur in combination the rate of corrosion is greatly increased. If corrosion is allowed to go unchecked the result, of course, is costly shut-downs for repair and expensive replacements.

Throughout the South, hundreds of engineers rely on ALKASTEEM and OX-GEM and the counsel of Anderson's field service representatives to check these corrosive gases. The life of equipment is prolonged and the operating efficiency of your system is increased. The Anderson man is a good man to know.

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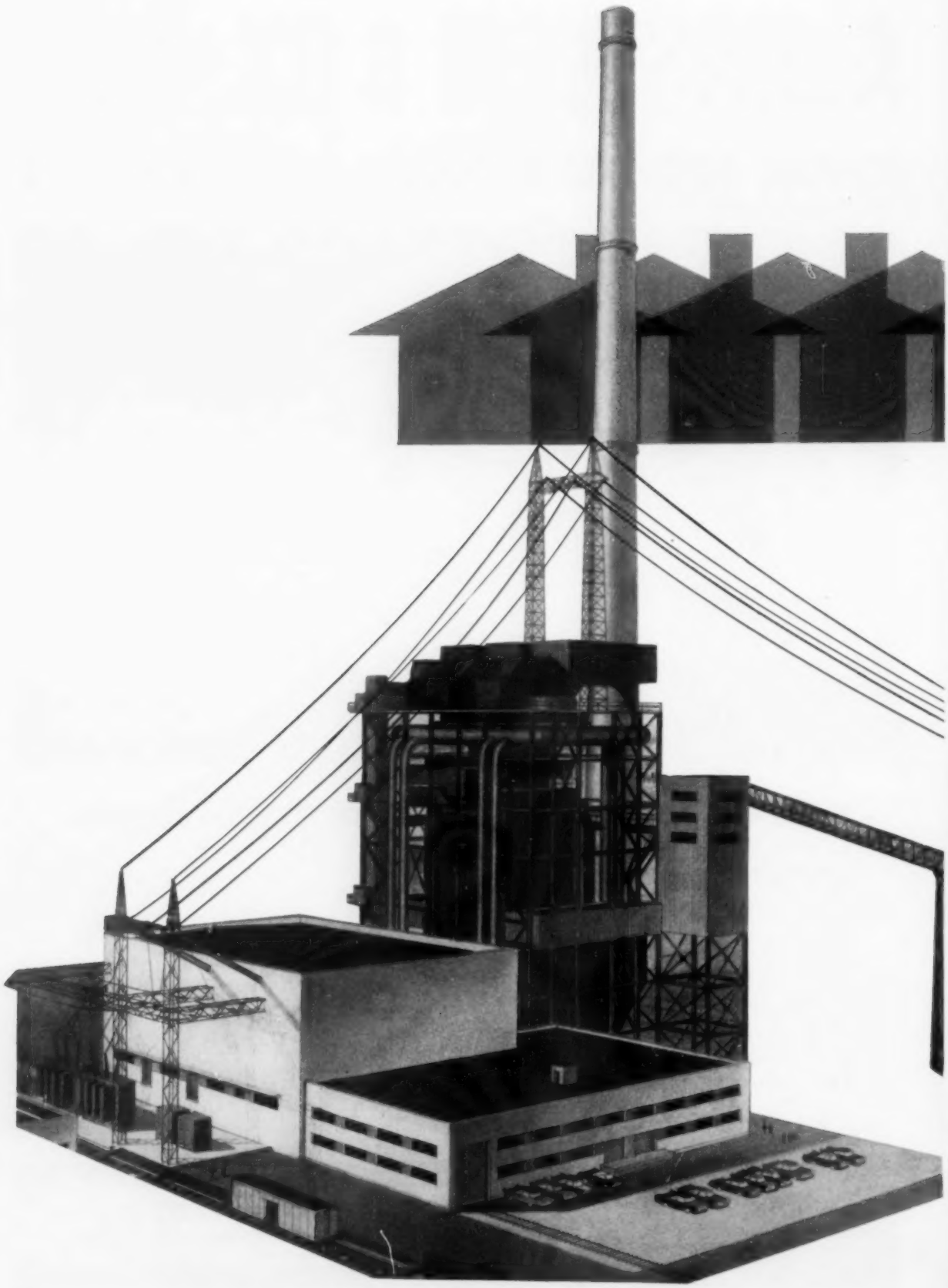

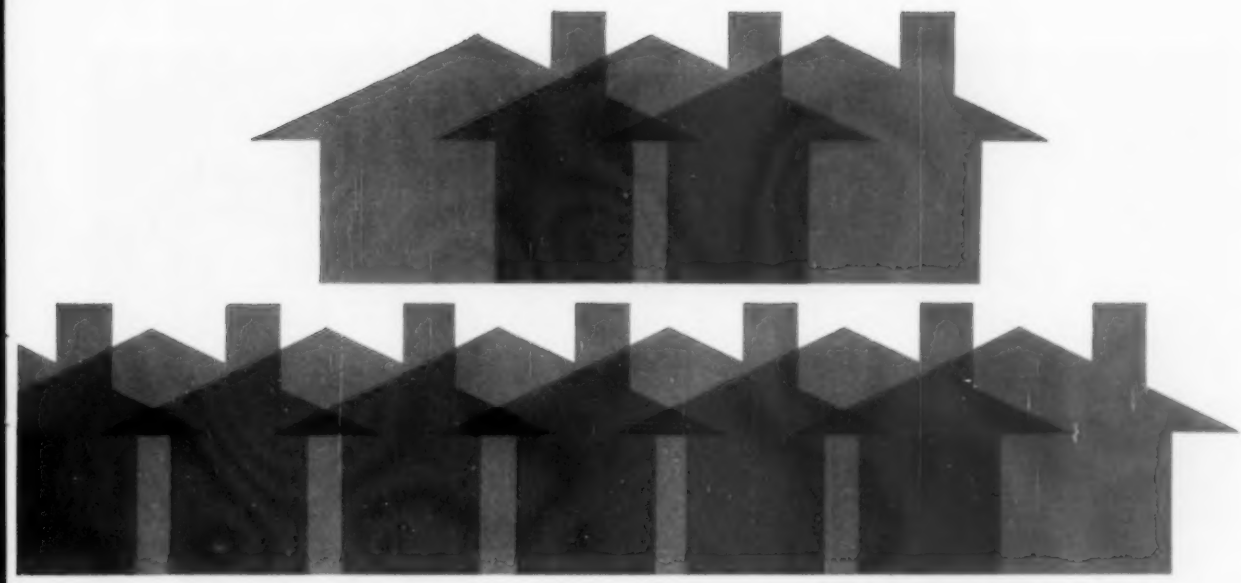

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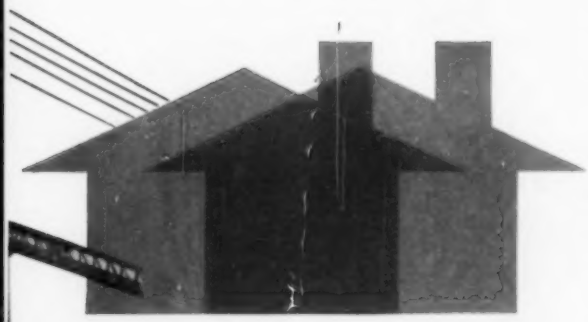

The addition of two new Universal Pressure® Steam Generators —one now on-the-line at the American Electric Power System's Breed Plant, the other under construction at AEP's Philip Sporn Plant—marks a major milestone in the expansion of power utilities to meet America's surging demands for electricity.

Together, these units will provide steam at supercritical pressures (3500 psig at 1050 F/1050 F/1050 F) to generate about eight billion kilowatt hours of electricity annually. Each of these steam generators will consume a carload of coal every twenty minutes. Because of the improved cycle efficiency of these units, electricity generated from this fuel will be sufficient for the annual needs of over two million average American homes—130,000 more homes than could be supplied by burning the same amount of coal in the best generating stations now in operation in the world.

Net power of these stations is about twice that produced annually at Hoover Dam . . . yet cost of putting these new plants on stream (per kilowatt of electricity) will equal about 1/3 that of building a new Hoover Dam today.

Expansion is the measure of the future — and products of Babcock & Wilcox engineering and research will pace much of the nation and the utilities industry.

For more detailed information on the UP® Steam Generator and other B&W power generating systems and designs write: The Babcock & Wilcox Company, Boiler Division, Barberton, Ohio.

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Most water tube steam generators operate intermittently. When dew point is approached at low fire condition, corrosive product can form quickly in single casing boilers.

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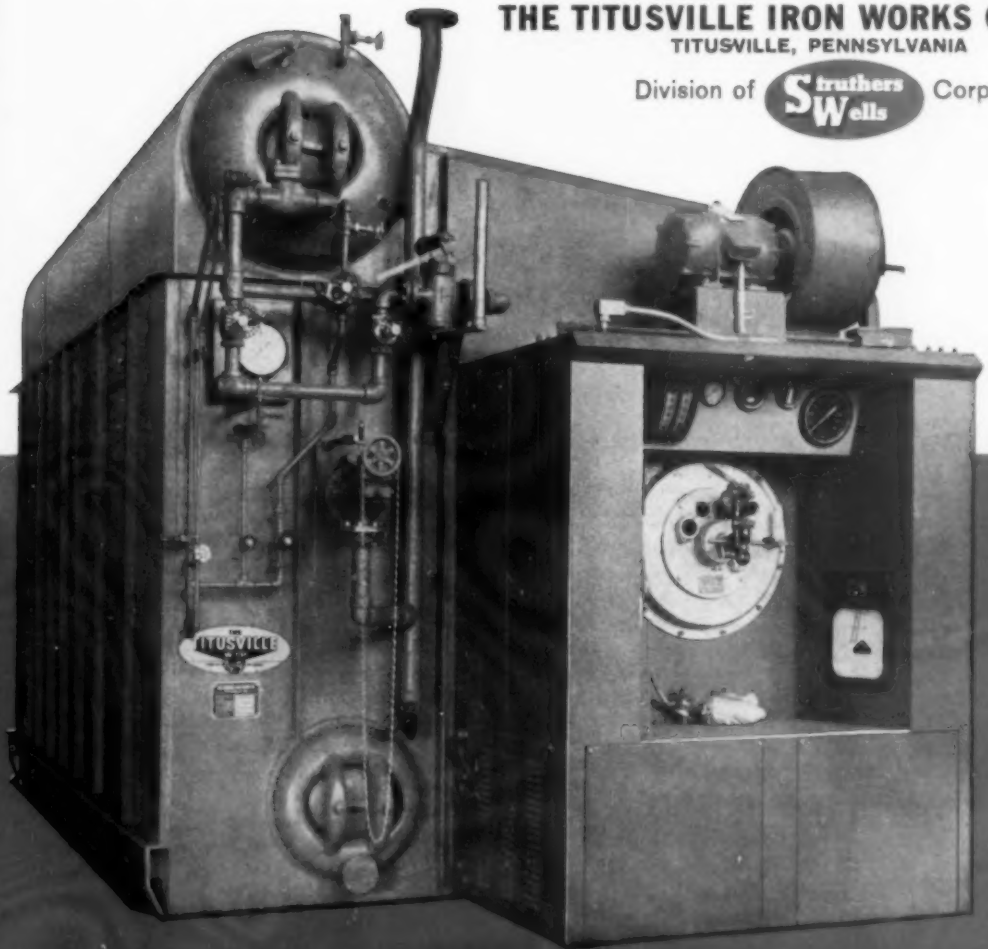

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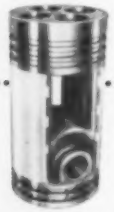

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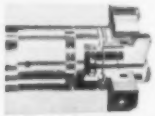

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Welding Costs Cut

GRIGGS EQUIPMENT, Inc., Belton, Texas, a well-known manufacturer of metal and wood furniture for school, church and auditorium seating, was faced with the problem of increasing the quality of steel tubing joints. The joints were brazed with a flux coated bronze rod. Excessive build-up gave joints a poor appearance. Rejects were averaging 2%.

Thinking in terms of a more suitably coated alloy, Mr. Richardson, Vice-President in charge of production for the Texas manufacturing firm, sought the advice of Ed Garland, owner of Alamo Welding Supply Company of Austin, Texas.

After studying the method used and observing results, Mr. Garland came up with an entirely different solution. He recommended the use of a bare bronze welding rod and a liquid flux fed automatially through a dispensing unit and pre-mixed with acetylene to the flame. The system, known as Jet Flux, is supplied by All-State Welding Alloys Company, Inc.

Quality of welds improved immediately. Finished joints were smooth with strength equal to or better than joints made with coated rods. Filler metal flowed faster around joints, and less of it was required. Joining-metal costs were slashed 10%. Little or no flux clean-up was required with Jet Flux, and for all practical purposes rejects became non-existent.

Wood Construction

(*Continued from page 33*)

umns. This was accomplished by the use of bowstring trusses constructed of laminated Southern yellow pine.

The trusses have a straight bottom chord and a curved top chord fabricated to a radius of 140 feet, the same as the truss span length. The bottom chord is built up of six 2" x 6"s glue laminated to form a finished member 5⅛" x 9¾". The top chord is built up of nine 2" x 6"s to form a curved member 5⅛" x 14⅝".

The building columns are also

laminated but all other members are fabricated from solid timbers. A 2" tongue and groove wood roof deck with four ply built-up roof fits the curvature of the building trusses, and corrugated iron siding completes the enclosure of the building.

Shipping Building

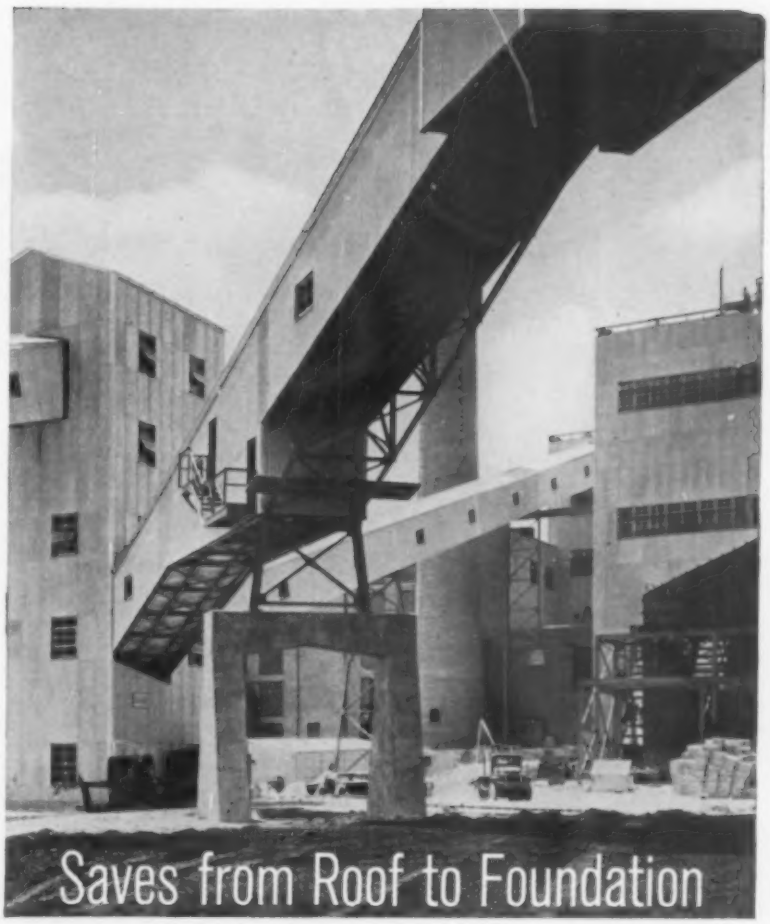
Adjoining the end of the planing mill is the new shipping building. Past records of shipments and predicted future trends indicated to Angelina the need for space to load six to eight rail cars and five trucks. These needs developed the building size of 80 feet by 400 feet. The entire 400 foot length of one side of the building is devoted to a rail car loading dock set at car-door height. With the building floor and the car at the same level, mechanization of package loading is made easier.

Storage Building

The dressed storage building, designed to hold 3,000,000 feet of lumber, is located perpendicular to the shipping building and adjoined to its side. This makes for ease of lumber flow from planing mill to shipment or storage and from storage to shipment. This building is 120 feet wide by 400 feet long with 20 foot eave height. Storage is in four rows of lumber packages the length of the building with two aisles for access.

The floors of all the buildings and carrier and lift truck runways to and from the rough storage buildings are concrete to provide smooth travel and storage surfaces. This is expected to reduce maintenance on the carriers and lift trucks, minimize down-grading of the product from dust, and provide ease of cleaning and maintaining neat operating and storage areas.

Engineering, design and construction plans and specifications, and general supervision of construction of these new facilities were provided by H. E. Bovay, Jr., Consulting Engineers, Houston, Texas. Construction was handled by Brown & Root, Inc. Vern Ellis, Plant Superintendent, and Shirley Dickerson, Planing Mill Foreman, supervised planning and construction of the job for Angelina County Lumber Company.



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Gulf Power Co., one of the South's largest utilities, avoided a lot of maintenance headaches by using Ruberoid Corrugated Asbestos Sheets for roof and sidewalls of this addition to its steam plant at Crist, Florida.

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Installation economy is an important advantage when using Ruberoid Corrugated Asbestos. It permits construction without sheathing, so foundations, footings and steel or wood supporting members can be lighter, reducing overall building weight. Many of today's construction cost problems are solved with tough, nonrattling, virtually maintenance-free Ruberoid Corrugated Asbestos.

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VALVES
Fig. 16031—New, steel pressure seal "Y" globe valve for 600 pounds.
Fig. 11365—Steel pressure seal horizontal lift check valve for 1500 pounds. Piston guided disc.
Fig. 19003—Steel pressure seal gate valve for 900 pounds.

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Atomic Developments

(*Continued from page 51*)

one to two years.

Under the terms of a contract signed in February 1959 with the companies, the Atomic Energy Commission is sharing costs of the research and development program being carried out by the East Central Nuclear Group. General Nuclear Engineering Corporation is the nuclear design agent and the American Electric Power Service Corporation is the principal design engineer for the East Central Group. The Florida West Coast Nuclear Group, under the contract, would assume construction costs and would operate the plant for five years.

As a result of discussions with the Commission concerning the reoriented research program, the companies are exploring possibilities of modifying the present contractual arrangements. The companies have informed the Commission that it may expect to receive a proposal from them about January 1, 1961, for a revision of the present project arrangements. If the proposal is submitted, it would provide for the project to follow more closely the lines of the Third Round of the Power Demonstration Reactor Program, under which the Commission supports research and development for the project and a utility designs, builds, and operates the entire plant. Revision of the project will provide the Commission with greater assurance that the prototype would be constructed by eliminating certain of the contingencies under the present contract.

The plant, if constructed, would be located in Polk County, Florida, as a project under the Commission's Power Demonstration Reactor Program and would include a 50,000 electrical kilowatt reactor fueled with slightly enriched uranium. It would be designed as a prototype for a large central station powered by a gas-cooled, heavy water-moderated reactor fueled with natural uranium.

The Savannah River Operations Office of the Atomic Energy Commission has responsibility for administering the contract.

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Southern News Briefs

(Continued from page 22)

Unified Plant Design Featured at Power Show

Methods of plant integration will be extensively reviewed by exhibits at the **24th National Exposition of Power and Mechanical Engineering,** lending emphasis to the trend toward bigger and better plants in all branches of industry.

Displays will feature materials and equipment covering the entire scope of power production and the distribution and use of energy in various forms by all industries. A noteworthy aspect of most displays will be direct provision for the absorption of equipment into a unified plant design. The ultimate expression of this objective will often be found in provisions for automation.

The Exposition, under the sponsorship of The American Society of Mechanical Engineers, will provide a forum for designers and engineers in conjunction with the annual meeting. It will be presented at the New York Coliseum November 28 to December 2.

FUTURE EVENTS of Engineering Interest

Nov. 1-3: Material Handling Institute, Central States Show & Technical Conferences, Kentucky Fair & Exposition Center, Louisville, Ky. Paul A. Fisher, Ch. Engr., Anaconda Aluminum Co., Louisville, Gen. Chm.

Nov. 3-4: 9th Annual Instrumentation Conference, School of Engineering, Louisiana Polytechnic Institute, James W. Malone, Pub. Chm., Ruston, La.

Nov. 9-11: 2nd Power Industry Computer Application Conference, Chase Hotel, St. Louis, Mo. Power Division and Computing Devices Committee, American Institute of Electrical Engineers. Sec'y AIEE, 33 W. 39th St., New York 18, N. Y.

Nov. 10-11: Fall Textile Conference, Sir Walter Hotel, Raleigh, N. C. Sec'y, American Institute of Electrical Engineers, 33 West 39th St., New York 18, N. Y.

Nov. 16: Panhandle-Plains Regional Meeting, Natural Gasoline Assn. of America, The Herring Hotel, Amarillo, Texas. Wm. F. Lowe, Exec. Dir., 421 Kennedy Bldg., Tulsa 3, Okla.

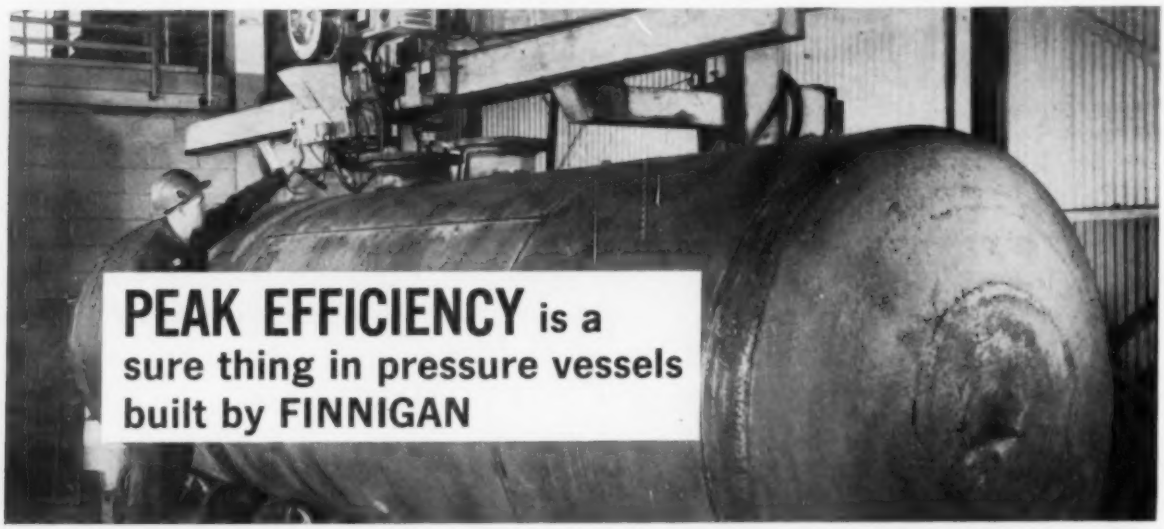
Nov. 28-Dec. 2: 24th National Exposition of Power & Mechanical Engineering, New York Coliseum. International Exposition Co., E. K. Stevens, Mgr., 480 Lexington Ave., New York 17, N. Y.

Nov. 28-Dec. 2: ASME Winter Annual Meeting, Statler Hilton Hotel, New York. Sec'y, American Society of Mechanical Engineers, 29 West 39th St., New York 18, N. Y.

Dec. 12-15: Industrial Building Exposition & Congress, New York Coliseum. Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

Jan. 20, 1961: Gulf Coast Regional Meeting, Natural Gasoline Assn. of America, The Robert Driscoll Hotel, Corpus Christi, Texas. Wm. F. Lowe, Exec. Dir., 421 Kennedy Bldg., Tulsa 3, Okla.

Jan. 23-26, 1961: Plant Maintenance & Engineering Show, International Amphitheatre & Palmer House,



Finnigan Hot Water Generators are engineered to give you large quantities of hot water for low operating cost. The finest materials, creative skill and quality construction assure efficiency in Finnigan equipment. These generators are fabricated from corrosive-resistant materials and contain copper removable-coil heating elements. Before leaving the plant, each generator must conform to ASME, API, U. S. Government and other specifications. "Fabricated by Finnigan" is your assurance of quality.
Finnigan builds hot water generators to your specifications. Call, wire or write today for complete information with no obligation to you.

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Washington 10, D. C., 3714 14th St.

Chicago, Ill. Clapp & Poliak, Inc., 341 Madison Ave., N. Y. 17, N. Y.

Feb. 13-16, 1961: 15th International Heating & Air Conditioning Exposition. International Amphitheatre, Chicago, Ill. American Society of Heating, Refrigerating & Air Conditioning Engineers, National Meeting. International Exposition Co., 480 Lexington Ave., New York 17. E. K. Stevens, Mgr.

Feb. 24, 1961: South Louisiana Regional Meeting. Natural Gasoline Assn. of America, Lafayette Petroleum Club, Lafayette, La. Wm. F. Lowe, Exec. Dir., 421 Kennedy Bldg., Tulsa 3, Okla.

March 5-7, 1961: Southern Safety Conference & Exposition. Atlanta Biltmore Hotel, Atlanta, Ga. W. L. Groth, Exec. Dir., Box 8927, Richmond 25, Va.

March 15-17, 1961: 40th Annual Convention. Natural Gasoline Assn. of America, The Baker Hotel, Dallas, Texas. Wm. F. Lowe, Exec. Dir., 421 Kennedy Bldg., Tulsa 3, Okla.

April 5-7, 1961: AIEE Southeast District Meeting. Jung Hotel, New Orleans, La. Sec'y, American Institute of Electrical Engineers, 33 West 39th St., New York 18, N. Y.

April 12-13, 1961: AIEE Materials Handling Conference. Hotel Sheraton, Philadelphia, Pa. H. A. Zollinger, Chm. AIEE Materials Handling Subcommittee, Westinghouse Electric Corp., Pittsburgh, Pa.

April 28, 1961: Oklahoma Regional Meeting. Natural Gasoline Assn. of America, Lake Murray Lodge, Ardmore, Okla. Wm. F. Lowe, Exec. Dir., 421 Kennedy Bldg., Tulsa 3, Okla.

May 19, 1961: Permian Basin Regional Meeting. Natural Gasoline Assn. of America, The Lincoln Hotel, Odessa, Texas. Wm. F. Lowe, Exec. Dir., 421 Kennedy Bldg., Tulsa 3, Okla.

General Electric — N. C.

Robert J. Guidera has been appointed product sales engineer for the Hickory, N. C., plant of **General Electric's** distribution transformer department.

Mr. Guidera is a graduate of the United States Military Academy. He joined the test program of General Electric in 1954 and held various engineering and marketing positions in the power transformer and meter departments.

Snap-on®

Electric IMPACT WRENCH

You Handle All These Jobs FASTER...EASIER

- Tighten and loosen nuts up to 90% faster than by hand
- Turn most pullers
- Drive and remove screws, lag bolts
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This SNAP-ON electric impact wrench is one of the handiest tools in the shop. It works so fast and easy your men can turn out double and triple the work without even thinking about it.

There's extra safety, too, in an impact wrench. A man can get up on a ladder or work in awkward positions without fighting the side thrust of a regular electric tool. Also, on drill or other work it won't burn out if the attachment gets stuck.

The tool's one-half inch square drive takes sockets 3/8 to 1-1/16 in. — many accessory tools available. Two models — 115 volts, 220/230 volts. Tool is top quality throughout — has many construction advantages. Get full details from your SNAP-ON representative. Factory branch warehouses in principal industrial centers. Or write us.

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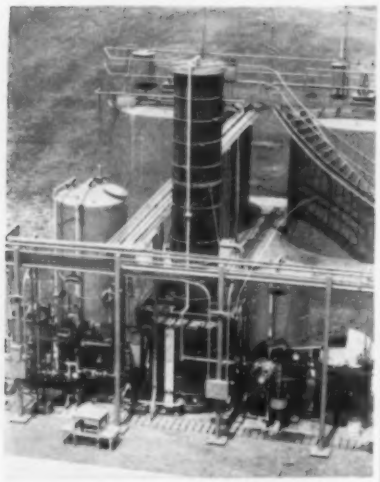

"SILICA: 0.003 PPM, OTHER SOLIDS UNMEASURABLE..."

With some doubt as to the outcome, the de-ionization units pictured above were installed outdoors at a Texas power and light company, to replace evaporation equipment as a means of purifying feed water for a high-pressure boiler. After three years, results far exceeded guarantee and expectations. From raw water containing 27 ppm of silica and dissolved solids totaling 365 ppm, the quality of the effluent is reported as: "Silica, zero to 0.005 ppm, average 0.003 ppm. Other solids are unmeasurable."—This is a good example of what modern ILLCO-WAY ionXchange can accomplish.

BOILER FEED WATER FOR POWER PLANT

The particular plant shown above consists of a cation exchanger, an aerator, and a mixed-bed deionizer. The large tanks in the background hold a supply of regenerants. Operation is manual throughout, a preference of the purchaser. *Results have proved even more economical than expected.*

ionXchange

ILLINOIS WATER TREATMENT CO.

ILLCO-WAY

840 CEDAR ST.
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ILLINOIS

NEW YORK OFFICE: 141 E. 44th St., New York 17, N.Y.
CANADIAN DIST.: Pumps & Softeners, Ltd., London, Ont.

TEX-VIT PLANT ADDITION — Structural steel work forms an outline for the new 100-ton Swindell-Dressler tunnel kiln at **Texas Vitrified Pipe Company,** Mineral Wells, Texas. Designed to vitrify clay sewer pipe, the kiln is expected to add about 60 per cent more capacity to present production. Tex-Vit's plant will be equipped to make clay pipe in diameters up to 36", and in lengths up to five feet.

New Production Unit for Lion Oil Co. — Arkansas

A new sulfur recovery unit with a daily capacity of 15 tons of elemental sulfur is now on stream at Monsanto Chemical Company's Lion Oil Company Division refinery at El Dorado, Ark.

Formerly a waste material in fuel gas used to heat steam boilers at the plant, the sulfur now produced as a by-product will be sent in molten state to Monsanto's El Dorado chemical plant to be used in the manufacture of sulfuric acid. The acid is widely used in the manufacture of fertilizer, explosives, and many other organic and inorganic chemicals. Sulfuric acid is used also in the treatment of product streams at the refinery, including its use as a catalyst in the plant's alkylation unit.

An important additional objective in the construction and operation of the new production unit is the prevention of air pollution from sulfur compounds which ordinarily would escape into the atmosphere in gaseous form.

Border Steel Building $4,300,000 Texas Plant

The tri-state area formed by West Texas, New Mexico and Eastern Arizona, is getting its first steel-making plant — located at El Paso on a 100-acre site. Construction on the $4.3 million installation for **Border Steel Rolling Mills Inc.,** was started on Oct. 1, and the mill will be producing ingot steel in May, 1961.

Fifty acres of the site will accommodate the mill proper. Latest smoke and fume abatement processes will be used. Initial plant capacity will be 4,000 tons of steel per month in rods and bars. It will feature an electric melt shop.

The scrap yards and steel fabricating plant will be built later behind the mill on the second 50 acres. A third 50-acre spread is reserved for possible expansion.

Edward J. Winter is vice-president and general manager of the mill. Stone & Webster made the engineering surveys. Swindell-Dressler Corp. are the engineers for plant construction. E. W. Bliss & Co. is furnishing the rolling mills, and Electra-Melt Corp. is making furnaces and allied equipment. Ramsey Steel, an El Paso fabricating and construction company, is building the plant.

Carpenter Steel — Tex.

The Carpenter Steel Co., Reading, Pa., has opened an office in the Lee Park Building, 3511 Hall Street, Dallas, Texas.

The new office, which is the company's first in Texas outside of its Houston service center, will serve the Dallas-Fort Worth marketing area and will provide faster service for more than 25 cities in the territory, as well as in nearby states.

John D. Wilson and Harold G. Sims have been assigned as sales representatives.

Air Products — Va.

A major industrial gas facility has been put on stream by **Air Products, Inc.**, at Hopewell, Va. The plant produces 18,000,000 cubic feet per month of ultra-high purity gaseous hydrogen.

In addition to new plants at Hopewell, Va., and Newark, N. J., the company also operates hydrogen facilities at Edgewood, Md. and Painesville, Ohio. With the new plants, Air Products' capacity will exceed 75,000,000 cubic feet per month.

High purity gaseous hydrogen is used in metal heat treating processes, hydrogenation of fats and oils, biological applications and in the electronics industry.

New Catawissa Pres.

Craig L. Davis was named president of Catawissa Valve & Fittings Company, Catawissa, Pa., at the firm's recent annual meeting of stockholders.

Mr. Davis joined the pipe union and valve manufacturer in 1946 as plant engineer, and in recent years has been the company's Chief Engineer. He had previously been connected with the hydraulics division of Glenn L. Martin Co., Baltimore.

1960 Power Show

Automatic systems for regulating the overall performance of power plants will be among the outstanding developments exhibited at the **24th National Exposition of Power and Mechanical Engineering** at the New York Coliseum November 28 to December 2.

The biennial Power Show will feature variety of new equipment for tying power plant units into an unbroken stream line to convey energy from the fuel through the combustion and heating processes to the connnected power load. The new "sophisticated" control systems are designed to figuratively "take the pulse" of operating units, analyze the individual operations and regulate controls. Instruments that determine the data that such a robot intelligence system would process will be shown.

In addition to equipment for generating stations, the Exposition will feature equipment for manufacturing plants in many different fields. A line of heavy duty metering pumps, gravimetric feeders, pressure sensitive instruments, purge meters and chlorinators, covers a wide range of applications.

New fuel cut-out control by Reliance

Pipe one device for double protection

and add alarm for approaching low water level if desired . . .

Reliance Levalarm EA-100P

Using but one water chamber — one set of pipes to boiler — this new Reliance Fuel Cut-out and Alarm control gives you two efficient devices in one.

At one end (right hand above) a positive float-operated switch cut-out; at the opposite end, an electrode-type control using U.L.-approved transformer-relay hook-up — completely independent of the float-type control but employs a common water chamber.

Check these possible use-combinations of the Levalarm EA-100P:

1. Dual fuel cut-out control.
2. Float-operated fuel cut-out and electrode-operated low water level alarm.
3. Electrode-operated fuel cut-out and float-operated low water alarm.
4. Float-operated fuel cut-out and electrode-operated fuel cut-out and electrode-operated low water alarm.

This Levalarm is the convenient answer in cases where two independent fuel cut-outs are required.

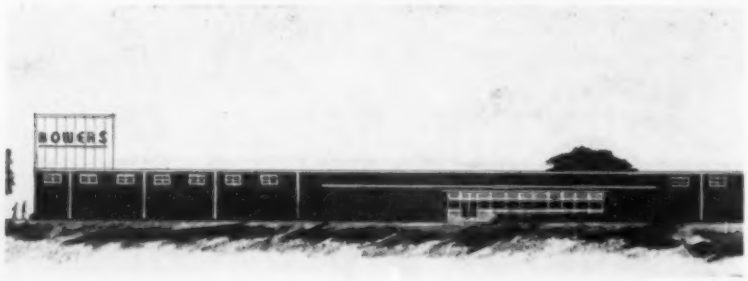
And this Levalarm provides outstanding additional safety to the operation of factory assembled boilers.

Write today for full description of this new safety device.

The Reliance Gauge Column Company • 5902 Carnegie Avenue • Cleveland 3, Ohio

Reliance BOILER SAFETY DEVICES

Southern News Briefs (Continued)



Battery Plant — S. C.

In a move that will add to the diversification of industry in Greenville County, South Carolina, the **Bowers Battery and Spark Plug Company,** of Reading, Pa., announced plans to build a modern, one story plant at a total investment of about $1,250,000.

The 20-acre site selected for the plant is on Route 29 just west of Greer. According to Alex J. MacRae, Executive Vice-President and General Manager of the Bowers Company, it is expected that the building will be equipped and ready for operation in January, 1961.

The company manufactures automotive, industrial truck, mine locomotive, aircraft and emergency lighting batteries and spark plugs.

Wagner Opens Arkansas Plant

Wagner Electric Corporation, St. Louis, Mo., announces that production of standard fractional horsepower motors has started at its new manufacturing plant at Brinkley, Arkansas.

The modern one story, 90,000 square foot building was designed for a continuous-flow layout of machines, assembly lines and testing equipment, to enable the company to increase production of its small motors.

Bovay Personnel Changes

H. E. Bovay, Jr., Partner of H. E. Bovay, Jr., Consulting Engineers, announces that George C. Love has been transferred from Houston, Texas, to the firm's Richland, Washington office, replacing Robert O. Grimes as Chief Engineer.

R. O. Grimes now assumes his former position as Associate of the Bovay Houston organization, and has resumed his duties as Senior Project Engineer. He will also serve as Assistant Projects Manager to Charles A. Lawler, Partner.

Mr. Grimes was one of three Houston office engineers who went to Richland in June 1959 to help in administering and staffing a branch office to provide engineering services under a contract with the Atomic Energy Commission.

Prior to Mr. Grimes' 15 months as Chief Engineer of the Richland, Washington office, he was Project Engineer on various industrial and commercial jobs of which the $18,-

Same formula as famous Kroil that has pleased 14,000 industrial users for 10 years or more.

Loosens stuck together metal parts, bushings, bearings, bolts, screws, pipe, etc., "anything from an embalmer's needle to a bulldozer," one customer said.

"Like an extra employee," said another. "Turned rust into mush, put $50,000 equipment back to work."

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000,000 Kirby Lumber Corporation Lumber Mill at Silsbee, Texas, Ten Ten Parking Garage, and the WKM Foundry are the best known.

Mr. Grimes is a native Houstonian, graduate of The Rice University, member of the San Jacinto Chapter of the Texas Society of Professional Engineers, Fellow of ASCE, and holds engineering registrations in Texas and Washington. He has been with the Bovay firm for eight and one-half years.

Hooker Reid Co. — Ga.

Hooker Reid Company, P. O. Box 11754, 4271 Garmon Road, Atlanta, Georgia, has been formed as manufacturers' representative for the Southeast. Owner of the company is Jack Reid, a Registered Professional Engineer in Georgia, who has had thirty years' experience in industry and sales.

Lines of equipment for both the mechanical and electrical fields are being handled. Among the companies represented are Dynamatic Division, Eaton Mfg. Co.; Master Levels Controls Co.; Excel Electric Service; Kerrco; Lexington Electric Products Co.; and King Knight Co.

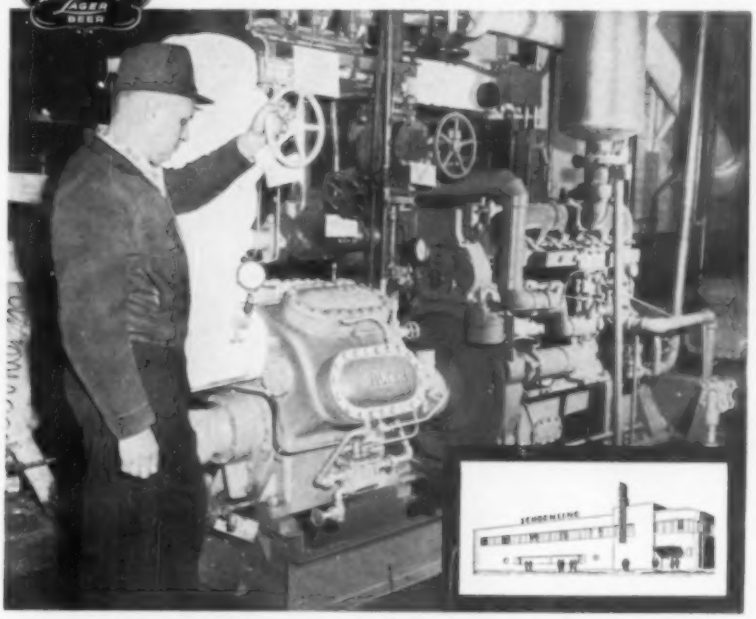
Daystrom — D.C. and Ga.

Among several recently named systems engineering coordinators for **Daystrom, Incorporated,** Control Systems Division, are Robert R. Burns in the Washington, D. C., area; and Robert Richards, 716 Longwood, Atlanta, Georgia, in the South and Southwest.

At the same time, the company announced the appointment of Thomas Waldrop, a native of Atlanta and a graduate of Alabama Polytechnic Institute, as systems sales manager for the utility industry, with headquarters at LaJolla, Calif.

Top Efficiency Brewing Schoenling with a Gas Driven Vilter Compressor

The Schoenling Brewing Co., Cincinnati, has earned a reputation for fine beer with **Schoenling Cincinnati's Finest.**



Mr. Raymond Winterhalter, Chief Engineer, The Schoenling Brewing Co., inspecting the gas driven Vilter VMC ammonia compressor. Inset shows exterior view of the brewery.

To most efficiently meet summer brewery refrigeration requirements, the Schoenling Brewing Co. has added a Vilter 8-cylinder VMC ammonia compressor driven by a natural gas engine to its earlier purchased electric motor driven Vilter compressors.

By switching to the natural gas engine driven compressor during the summer months, when its gas requirement for heating purposes is reduced, Schoenling is able to utilize the major portion of the gas charged for, thereby reducing electric power demand and effecting considerable savings.

The natural gas engine driven compressor is especially ideal where capacity reduction is necessary to match widely fluctuating loads. Automatic speed regulation of the power unit can be supplied so that, together with the automatic capacity control available on Vilter VMC compressors, the most economical engine speed to suit the refrigeration requirements is automatically selected and maintained.

Schoenling is well pleased with the operation of the gas driven Vilter VMC compressor, and as a result of the reliability obtained, they have been able to reduce their cost of operation.

Almost 90 years of service to the brewing industry has given Vilter the necessary experience to produce the superior refrigeration equipment used with satisfaction in hundreds of breweries throughout the world. Let our qualified engineers help you with your problems.

Sold through Vilter Distributor, C. P. Wood and Company, Cincinnati

Vilter® refrigeration air conditioning

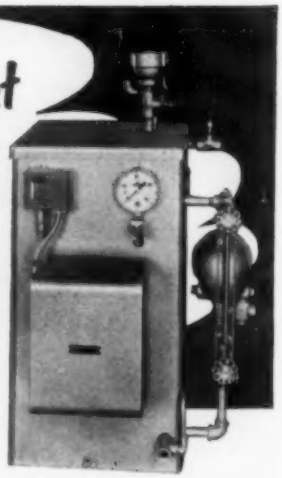
The Vilter Manufacturing Company
Milwaukee 7, Wisconsin

Air Units • Ammonia and Freon Compressors • Booster Compressors Baudelot Coolers • Water and Brine Coolers • Blast Freezers Evaporative and Shell and Tube Condensers • Pipe Coils Valves and Fittings • Pakice and Polarflake Ice machines.

Write for Bulletin 017 to The Vilter Manufacturing Company, Dept. SP-602 2217 South First Street Milwaukee 7, Wisconsin

100-pound steam you can set ANYWHERE!

The New S-100A
PANTEX
SPEEDYLECTRIC
Electric Steam Generator



★ Low cost
★ No flues—no stack —no storage tank
★ Steam at the flick of a switch
★ No heaters to burn out
★ 15" wide x 20" long x 28" high

This compact, easily installed 1½ h.p. generator develops steam at pressures up to 100 psi at very low cost! Sets close to equipment. For 220, 440 and 550-volt service. A.S.M.E. code. Write now for descriptive bulletin!

PANTEX builds a complete line of electric steam generators and electric and fuel-fired steam jet cleaners. Technical bulletins on request.

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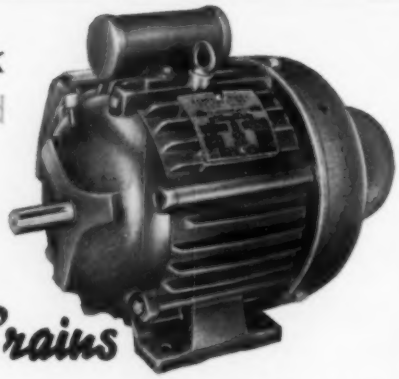
this new Brook totally enclosed fan cooled, single phase motor has



Brawn and Brains

The BRAWN is in the rugged design, producing cool operation and long service life and in the housing, which keeps out dust and moisture . . . and the external fan which blasts cooling air over the heat dissipating fins on the housing.
The BRAIN is in the external centrifugal switch which positively disengages when motor has attained pre-set speed. Switch is on outside of motor for accessibility . . . just remove cap. No need to disassemble the motor or remove it from line for switch repairs. Same switch fits all sizes of motors . . . 1 to 5 HP.
You get real economy where dust, fumes or moisture are a problem. Dealers everywhere. Send for literature.

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News Briefs (Cont.)

Sylvania — W. Va.

Richard G. Slauer has been appointed Manager of Engineering-Fixtures, for **Sylvania Lighting Products,** a division of **Sylvania Electric Products Inc.,** with headquarters at Wheeling, W. Va.

Mr. Slauer, who succeeds George W. Clark who has been appointed Marketing Manager-Fixtures, has spent more than 34 years in lighting and since 1944 has been with Sylvania.

Prior to joining Sylvania, Mr. Slauer worked in various engineering assignments in the lamp works of General Electric Co. and subsequently spent several years in the Westinghouse Lamp Division.

Tube Turns — Tenn.

Appointment of James E. Hailey Co., 726 16th Ave., South, Nashville, as special manufacturer's representative was announced recently by **Tube Turns Division of Chemetron Corporation,** Louisville, Ky.

The Tennessee company will handle sales of Tube Turns' test-rated bellows joints in central and eastern Tennessee, east of the Tennessee River.

High Voltage Engineering Corporation — Southwest

High Voltage Engineering Corporation, manufacturer of radiation-producing particle accelerators, recently announced the appointment of Southwestern Engineering and Equipment Company, Dallas, as sales representative in Texas, Oklahoma, New Mexico, Colorado, Louisiana, Kansas and Arkansas.

Southwestern will handle the complete line of High Voltage Van de Graaff and microwave linear accelerators, used in science and indus-

try for nuclear physics research, therapy, radiography, activation analysis, radiation chemistry and industrial processing. Company sales offices are located in Dallas at 4045 Lemmon Avenue and in Houston at 4101 San Jacinto Street.

Atlas Valve — S.E.

Atlas Valve Company, manufacturer of automatic pressure, temperature and level controls, announces that Heat & Power Equipment Company, 2842 Selwyn Avenue, Charlotte, N. C., has been appointed as sales representative for North Carolina, South Carolina and Eastern Tennessee.

H. K. Porter Appoints North Carolina Engineer

Stuart W. Johnson, recently of Charlotte, N. C., has been appointed product sales manager of transformers for **H. K. Porter Company, Inc.**, Delta-Star Electric Division's Electric Service Works in Philadelphia.

Mr. Johnson, a graduate electrical engineer and an associate member of AIEE, belongs to the Charlotte Engineers Club and is a Registered Professional Engineer of North Carolina. He has had extensive experience as test engineer, transformer designer and specialist, and sales engineer in the electrical manufacturing field.

1961 Maintenance Show

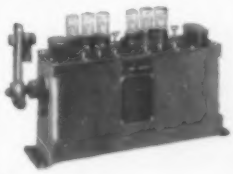
The twelfth annual Plant Maintenance & Engineering Show will run for four days, from January 23 through 26, 1961, at the International Amphitheatre in Chicago. The conference will run for three days, with morning sessions at the Amphitheatre and evening sessions at the Palmer House.

The 1961 exhibit area is expected to exceed six acres, and about 375

How to STRETCH

a drop of oil...

Manzel force-feed lubricators squeeze the full potential out of every drop of oil you purchase. Model "94", for example, pumps against pressures up to 3,000 pounds, handling any grade of oil from the lightest mineral oil to the heaviest cylinder stock with the same regularity. Model "94" starts, stops, speeds up and slows down in synchronization with your machinery. Every change in engine speed brings a corresponding change in the amount of oil delivered. For details on our whole line of *responsive, responsible* lubricators, write for our catalog. Manzel, 257 Babcock Street, Buffalo 10, New York. For the most efficient lubrication,



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A UNIT OF HOUDAILLE INDUSTRIES, INC.

Manzel

SPECIALISTS IN LUBRICATORS AND METERING PUMPS SINCE 1898

Southern News Briefs (Continued)

companies are expected to participate. Theme for the show will be "The Maintenance Operation Meets the Needs of Increased Production."

Visitors who wish to receive advance rapid registration cards, hotel or conference information should write Clapp & Poliak, Inc., 341 Madison Ave., New York 17.

Barry Pump — Tulsa

W. R. Barry Pump Co., Tulsa, Okla., has announced the appointment of Max E. Landry, Inc., 407 N. Cincinnati, Tulsa, Okla., as authorized exclusive sales agency for the Barry V60 quadruplex plunger pumps.

Air Reduction — K.C.

Blaine G. Harrington has been appointed manager of **Air Reduction Sales Company's** Kansas City district, with headquarters at 2701 Warwick Trafficway, Kansas City 8, Missouri.

Mr. Harrington succeeds J. O. McElligatt who retired in July. He has been with Air Reduction since 1941 in various posts. Most recently he was assistant manager-sales in Kansas City, a position he had held since 1953.

Morse Chain — S.W.

Morse Chain Co. has announced the appointment of Robert J. Koch as Southwest Regional Sales Manager, with headquarters at the new Morse Warehouse, 2702 Chenevert Street, Houston 4, Texas. His territory includes the states of Texas, Louisiana, Mississippi, Oklahoma and Southern New Mexico.

A member of the company staff for 30 years, Mr. Koch has had extensive experience in power transmission. He returns to Houston after five years of sales administrative work at the New York headquarters.

Ceilcote — Carolinas

The Ceilcote Company has announced the appointment of Corrosioneering, Inc., 1909 Wensley Drive, Charlotte, N. C., as sales representative for both North and South Carolina.

Reynolds Wire — S.W.

Bruce E. Sill has been named sales representative for the Southwest by **Reynolds Wire Division, National-Standard Company.** He will cover Missouri, Oklahoma, Arkansas, Texas, Kansas and Louisiana.

A graduate of Notre Dame University, Mr. Sill was formerly a territorial manager for Smith Welding Equipment Company. He lives at 1595 Thoroughbred Lane, Florissant, Mo.

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complete range

flared, flareless, or pipe fittings. Valves and drain cocks.

brass
stainless steel
carbon steel

pressures up to 10,000 p.s.i.

sizes for ⅛" to 2" O.D. tubing ⅛" to 2" pipe

quantities for large production for small maintenance needs

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Right in the heart of the Golden Triangle 400 outside rooms with TV and every comfort of modern hotel design. General Forbes Lounge and Dining Room . . . Air Conditioning. Airport Limousine and Taxi Service.

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The very finest accommodations. 60 air-conditioned rooms with TV, telephone, combination tile baths. Excellent dining room. Facilities for group parties 15 to 500.

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Lincoln Engineering — S.E.

A new branch office and warehouse at 1845 Marietta Blvd., N. W., Atlanta 18, Ga., has been established by **Lincoln Engineering Company** of St. Louis. J. P. O'Donnell directs the branch operation.

In addition to warehousing the company's products, the office provides service facilities for the Southeastern States of Georgia, Florida, North and South Carolina, Tennessee, Mississippi, Virginia and part of Louisiana.

STATEMENT

of the ownership, management and circulation required by the Act of Congress of August 24, 1912, as amended by the Acts of March 3, 1933, and July 2, 1946 and June 11, 1960 (74 STAT. 208) showing the ownership, management, and circulation of SOUTHERN POWER AND INDUSTRY published monthly at Charlotte, N. C., for October 1, 1960.

1. The names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, W. R. C. Smith Publishing Company, Atlanta 8, Georgia; Editor, Francis C. Smith, Atlanta 8, Georgia; Business Manager, Richard L. Priess, Atlanta 8, Georgia.

2. The owners are W. R. C. Smith Publishing Co.; Estate of W. R. C. Smith, Atlanta, Ga.; O. A. Sharpless, Atlanta, Ga.; J. C. Cook, Atlanta, Ga.; W. J. Rooke, Atlanta, Ga.; T. W. McAllister, Windemere, Fla; E. W. O'Brien, Atlanta, Ga.; Seba J. Jones, Atlanta, Ga.; Mrs. E. L. Philpot, Atlanta, Ga.; Richard P. Smith, Atlanta, Ga.; A. F. Roberts, Atlanta, Ga.; W. C. Herbert, Atlanta, Ga.

3. The known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or any other security holders are: None.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bonafide owner.

5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: (This information is required by the act of June 11, 1960 to be included in all statements regardless of frequency of issue.) 9,976.

E. W. OBRIEN, Managing Director.

Sworn to and subscribed before me this 28th day of September, 1960.

SEBA J. JONES, Notary Public.

My commission expires Feb. 28, 1962.

WHERE THE QUALITY BEGINS IN

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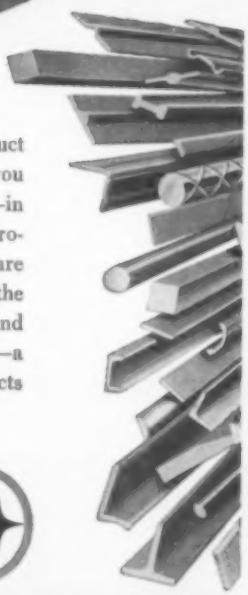

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Atlantic Steel Company

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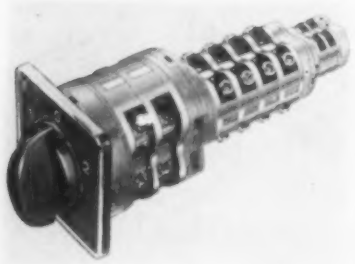
NEW Product Briefs

. . . there is always a BETTER WAY

Rotary Switches

W-1 A line of rotary switches employing a modular design to meet thousands of requirements at standard prices and on short deliveries, is announced by **American Solenoid Co., Inc.**, Union, N. J.



Switches with any practical contact arrangement can be assembled in a few minutes from modules in stock at a regional service center. A wide choice of mountings, enclosures, handles, escutcheons, attachments, and accessories is also available from stock.

Designated as "Blue Line" switches, these units are built around a stage, which contains up to 4 isolated, double-break, silver-alloy contacts. Up to 12 stages can be contained in a column, and up to 3 columns, arranged in tandem, can be used in a switch assembly. Hence, as many as 96 double-break contacts over 36 positions can be controlled from a single point.

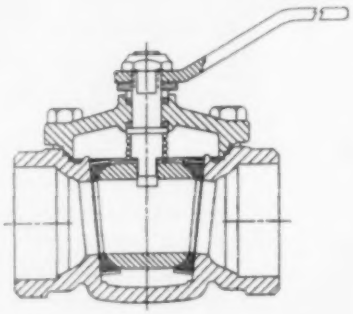
Standard ratings can be supplied at 20, 32, 40, 63, 100, and 200 amperes —600 VAC. All units are horsepower-rated for use in motor control, instrumentation, and control circuit applications.

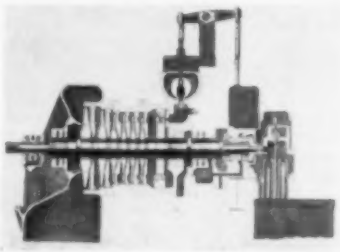
Top-Entry Ball Valves

W-2 Top-entry ball valves, manufactured by **Hills-McCanna Company**, 4600 W. Touhy Ave., Chicago, Ill., are now available with socket weld connections in 1, 1½, 2, and 3" sizes.

This new design permits the valve body to be permanently welded into the pipeline. Access to the valve parts is provided by a removable bonnet and stem assembly. Socket dimensions are made to American Standard Steel Socket-Weld Fittings Schedule 40. Body materials are carbon steel or stainless steel, type 316. Seats are Teflon or Buna-N.

In addition to the top-entry design, the "McCannaseal" valves feature fully self-adjusting ball seals and double back seated stem seals. They are designed for controlling gases, liquids, and semi-solids at temperatures from —100 F to 350 F. Maximum pressure is 700 psig, depending on temperature.

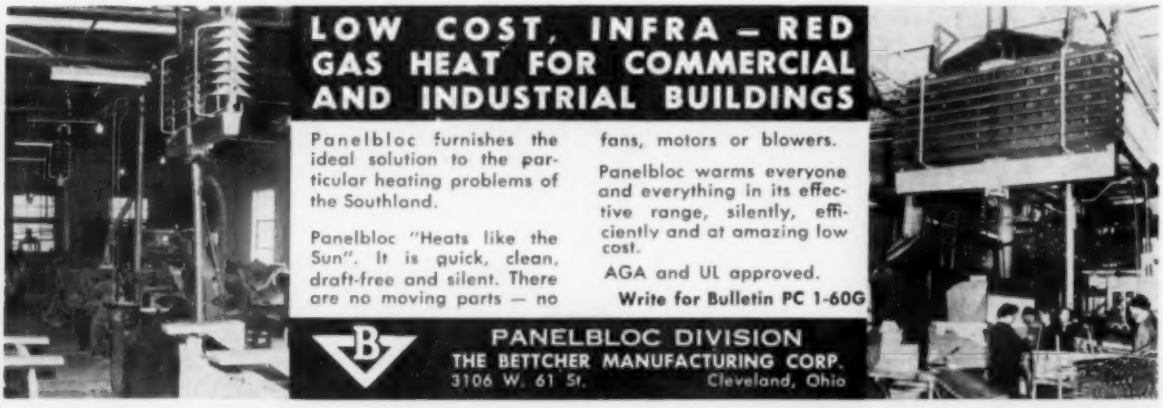




High-Speed Small Turbines

W-3 The line of small turbines manufactured by the **Westinghouse Electric Corporation**, Pittsburgh 30, Pa., has been extended to include high-speed multistage units. The new turbines, now available in five frame sizes, are rated to 32,000 horsepower and 16,000 rpm.

All sizes have been designed for maximum steam conditions of 1500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Panelbloc warms everyone and everything in its effective range, silently, efficiently and at amazing low cost.
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THE BETTCHER MANUFACTURING CORP.
3106 W. 61 St. Cleveland, Ohio

psig and 950 F, but conditions to 2400 psig and 1050 F can be accommodated for special applications. Exhaust pressure can be as low as one inch of mercury or as high as 300 psig on most sizes.

The new high-speed turbines can be built with as many stages as are needed, and with any of five wheel diameters from 12 to 32 inches.

Pavement Patching Material

W-4 **Revere Chemical Corporation,** 2010 East 102nd St., Cleveland 6, Ohio, has introduced "Sta-Fil," a permanent exterior patching material for holes, expansion cracks or other pavement upheavals.

The material is supplied ready to use without mixing, heating, or priming. It is applied cold at any temperature and during any weather conditions. Wet or moist surfaces do not strip or break the bond created by the compression of this cohesive aggregate. To apply, merely fill, then tamp or roll. Traffic can move immediately.

Tool "Float"

W-5 **Cordomatic,** 17th & Indiana Ave., Philadelphia 32, Pa., has introduced automatically retracting balance reels, specially designed for the suspension of electrical and non-electrical devices and tools.

The Model 700 BR has Underwriters approved grounding type electric reel assembly. It eliminates the need for a separate wire cable from which to suspend electrical tools. It is available with or without Twist-Lock connector, permitting multiple tools use. No junction box or installation expense is required.

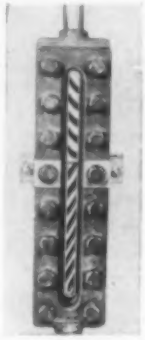
The Model 700 CR is a cable automatically retracting balance reel suitable for use with unwieldy air hose extensions, small parts bins, and paint sprayer equipment, as well as heavier portable electric tools.

Both models feature dust-proof, heavy-duty spring motors which are lifetime lubricated. They have self-lubricating oilless bearings; heavy gauge steel reel housing; and the bracket incorporates heavy-duty wall mounting which permits a 180 degree swivel, or a ceiling mounting providing full 360 degree rotation.

Gauge Glass Conversion Kit

W-6 The new "Zig-Zag" liquid level gauge glass conversion kit manufactured by **Windsor Equipment Sales Co.,** Little Falls, N. J., is engineered to show the liquid level at the junction of opposing slanted lines within the gauge glass. It also shows whether the glass is full or empty.

The gauge, which can be read from as much as 50 ft away, is equally legible whether vertical or inclined, fits all standard units, and is said to be easy to install, with no parts to wear out.



Prefabricated Buildings

W-7 **Atlantic Steel Company,** Atlanta 1, Ga., has introduced a complete new series of prefabricated, all-steel buildings for business and industrial use. The Dixisteel line now includes 183 basic models, and virtually any size or type of custom-designed building may be obtained by using combinations of standard units.

The rigid-frame design of these buildings permits a completely unobstructed interior, up to 120 feet in width, and any length. The metal sidewall and roof panels are of an improved, deep-rib pattern, of either galvanized steel or aluminum.

Available also are pre-painted panels in six attractive, contemporary colors. Two coats of baked-on vinyl enamel, over a primer coat, provide a beautiful finish which is virtually maintenance-free. New en-

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*American Pub. Health Assoc., Oct. 15, 1954

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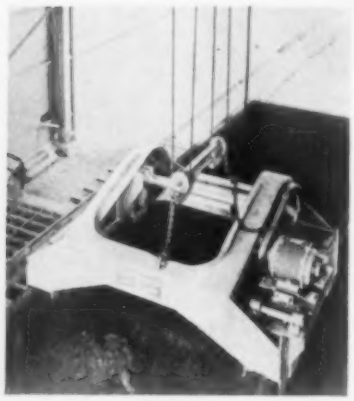
New Products (Contd.)

gineering details facilitate the architectural application of masonry, stone or glass fronts.

Dixisteel buildings are sold and erected by some 50 experienced dealers located throughout the Southeast.



Railroad Car Shaker

W-8 **Link-Belt Company,** Prudential Plaza, Chicago 1, Ill., has introduced a one-man-operated railroad car shaker for unloading of hopper bottom cars carrying bulk materials. From 8 to 10 cars may be unloaded per hour.

The shaker mechanism transmits low-frequency vibrations to the top of car sides, parallel to the horizontal axis of the car and in the direction of maximum strength, with no undesirable sidewise movement. Lengthwise shaking action is produced by two unbalanced weights mounted on a shaft which turns on two spherical roller bearings through a 20 hp motor.

The car shaker can be mounted anywhere along the length of the car, in single or multiple railroad track arrangements, with fixed or traveling hoists or cranes.

Encapsulated Motors

W-9 A new line of "Howellsealed" encapsulated motors . . . 3 or 2-phase, 1 through 125 hp a-c squirrel-cage . . . is announced by **Howell Electric Motors Company,** 16316 W. Seven Mile Rd., Detroit 35, Mich.

"Howellseal" is a specially-developed epoxy compound . . . applied under vacuum to surround each wire in slots and at coil ends to produce a solid, void-free mass.

These motors have the simplicity and high overload service features

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SPROCKET RIM

with Chain Guide

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— enables you to

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If re-aligning equipment will yield more working space, better production, lower costs — do it *now*. Save all space wasted for placing ladders to reach overhead valves. At the same time, convert Danger Zones to Safety Zones. Equip every overhead valve wheel in your plant with Babbitt Adjustable Sprocket Rims with Chain Guides.

- They simplify pipe layout.
- They fit any size valve wheel.
- They are easy to install and operate.
- They operate any valve from the floor.
- They save time and money.
- The first cost is the only cost (no maintenance).
- They are packed completely assembled (one to a carton), with easy-to-follow instructions.
- A hot-galvanized rust proof chain is available for all sizes.

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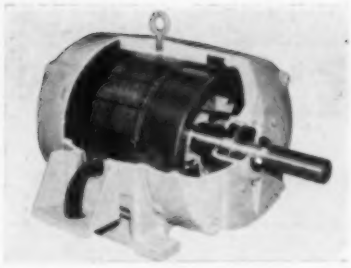
STEAM SPECIALTY CO.

3 BABBITT SQUARE, NEW BEDFORD, MASS., U.S.A.



of standard open motors and, at the same time, provide the winding protection of enclosed motors at a 10% to 30% lower cost, depending upon motor size.

This new line provides open-motor performance for applications usually requiring enclosed motors because of exposure to excessive heat, moisture, acids, gases, salts, alkalis, caustics, fine abrasives, shock or vibration.

Dry Chemical Feeder

W-10 **Infilco Incorporated,** Tucson, Arizona, has introduced a general purpose "Gravimetric" feeder, which handles all dry chemicals normally used in water and waste treatment, whether the chemicals are in powder, granule or lump form up to ⅜" in diameter.

Its finely balanced weighing mechanism gives an accuracy of plus or minus 1% of the set rate over an operating range of 20:1.

The entire "G" feeder is housed in a dust-tight enclosure. All electrical and operating controls are integral parts of the unit, but are separated from the feeding mechanism by a dust-tight partition. Agitators within the hopper prevent "arching" or "hold-up" of chemicals.

Transistorized Vibration Meter

W-11 A new, battery-operated, hand-carried vibration meter with high gain, transistor circuitry is being produced for the **Korfund Company, Inc.,** Cantiague Road, Westbury, N. Y., by Philips of The Netherlands.

The self-contained instrument, reading peak amplitudes of both absolute and relative vibrations directly on its large meter dial, can be used wherever vibrations must be measured or monitored. Readings are in microns, over its 5 cps to 1200 cps frequency range. It has a measuring range from 0 to 1000 microns value (0.039") in 5 steps, and a sensitivity down to 0 to 10 microns full scale (0.00039").

In every range, internal calibration is available, permitting calibration of meter and transducer to a high degree of precision. Easy to handle, it weighs only 5 lb and measures 9½" x 5" x 4" in size.

(*Continued on page 92*)

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STRONGLY ACIDIC -STRONGLY BASIC TWO-BED DEMINERALIZER

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3—Metallizing — Use industry's low-cost "putting-on" tool. Now within reach of the smallest shop. Bulletin tells how you can spray carbon steels, stainless, babbitts, brass, nickel, aluminum. — METCO.

6—Tool Truck — Save time with this compact truck carrying full tool selection to emergency repair jobs. Four drawer unit described in bulletin 8141-A. Semi-pneumatic 10" balloon tires ease heavy loads over rough pavements. — SNAP-ON TOOLS CORPORATION.

8—Ceramic Coatings — Chempro sprayed ceramic coatings to resist abrasion, erosion and corrosion described in Bulletin CP-28. Ideal for shaft, shaft sleeves, impellers, valves, cams.—CHEMICAL & POWER PRODUCTS, INC.

10—Floor Maintenance — Catalogs show how to maintain floors faster for less money with Lincoln-Wilshire automatic scrubbers, power sweepers and polishers. — AMERICAN-LINCOLN CORP.

14—Hose & Fitting Needs — Complete Weatherhead line described in Bulletins — flared, flareless, or pipe fittings; brass, stainless, carbon; pressures to 10,000 psi; sizes ⅛" to 2" O.D.; production or small maintenance quantities. — DIESEL INJECTION SALES & SERVICE.

17—Mechanical Packings — 32 page Cat. PC-103 describes a variety of packings and gaskets, including self-lubricating, sheet and molded packings. Includes application charts and price information. — GREENE, TWEED & CO.

27—Corrosion Control Systems—Brochure 9111 outlines five-step procedure for primary protection and preventive maintenance of all metal surfaces subject to acids, alkalis, solvents, fumes and gases.—TRUSCON LABORATORIES.

35—Stop Corrosion — 4 page bulletin tells how Alkasteem neutralizes carbon dioxide and Ox-Gem reacts with oxygen to stop corrosion in boilers, heaters, condensate returns, steam lines and traps. — ANDERSON CHEMICAL COMPANY, INC.

38—Heavy-Duty Wrench Set—Bulletin 8141-C details the Loxocket 521-EHD-B. Metal case containing 17 sockets from 1 7/16" to 3⅛", ratchet, sliding bar and two extensions — 8" and 16"—ready to go on any assignment.—SNAP-ON TOOLS CORPORATION.

58—Tube Expander Drives — Bulletin 581 gives data on complete line of Torq-Air-Matic automatic tube expander drives and explains the importance of precision control in tube expanding. Chart to aid selecting right model for the right job. —THOMAS C. WILSON, INC.

75—Storage Racks — How you can build them faster with Kee Klamp slip-on fittings described in Catalog K-25-D. Allen wrench only tool needed. Simple to erect; easy to dismantle. 58 varieties for pipe sizes ⅜" to 2". — KEE KLAMPS.

77—Plant Health Aid — Automatic footsprayer dispenses skin-toughening solution for prevention of athlete's foot. One gal of solution sufficient for 3,000 treatments. Catalog S-12 gives details. — ONOX, INC.

78—Control Heat & Glare — New folder tells how Sun-X Glass Tinting (transparent alkyd-based liquid plastic by DuPont) is applied directly to existing glass by flow process without spray or splatter. Bonds tightly. Wash in usual manner. — AMERICAN GLASS TINTING CORP.

84—Zinc Coatings — Bulletin No. 4 describes Galvanox-Type II (Epoxy) a zinc-rich coating to be used as repair item for damaged areas on galvanized sheets and structures. Provides both cathodic type and barrier protection. — SUBOX, INC.

FANS—PUMPS—COMPRESSORS HEATERS—HEAT EXCHANGERS

100—Power Plant Pumps—Bulletin BJP 58-8 covers complete line of standard pumps for power plant requirements — from 12,000 hp, doublecase boiler feed pump, to condensate, circulating and booster pumping duty. Also, special pumps for nuclear power plant installation. —BYRON JACKSON PUMPS, INC.

122—Industrial Fans — Bulletin 702 covers Type XL fans for air and material handling. Volumes to 130,000 cfm pressures to 18" SP. Catalog 855 describes Pressure Fans. Volumes to 12,000 cfm, 10" to 50" SP. —CLARAGE FAN CO.

128—How to Solve Pumping Problems — 36-page booklet gives general explanation of rotary gear pumps and factors involved in pumping; three sample problems; technical data — graphs and tables. — ROPER HYDRAULICS, INC.

142—Centrifugal Pumps — Full line of single stage horizontally split case centrifugal pumps described in 16 page Bulletin 721.6; capacities 200-6400 gpm; heads up to 425 ft; maximum standardization and interchangeability of parts.—GOULDS PUMPS, INC.

143—Chemical Feeders — 36 page Bul. 1136 describes metering pumps — types, construction, displacement and operating pressures. Gives handling recommendations for chemicals, acids, etc., and volumetric conversion tables.—MANZEL.

160—Boiler Feed Pumps — 12 page Bulletin 122 describes and illustrates the type BFI high pressure pumps. Design features, service ratings and engineering data included. —PACIFIC PUMPS, INC.

182—Centrifugal Fan Equipment — Catalog 515 covers complete, ready-to-run centrifugal fan equipment. Capacities 400 to 14,000 cfm. V-belt and direct drive units. Universal discharge feature. Available for outdoor installation.—CLARAGE FAN CO.

INSTRUMENTS—METERS CONTROLS—REGULATORS

203—Electric Control System—Bulletin E74-1 describes new control system operating over —25 to +25 volts d-c signal ranges. Electrically and electronically operated components are shown along with transmitting and power units. — BAILEY METER COMPANY.

207—Control Centers & Systems — Combustion safeguard and automation packaged control centers insure full coordination of complete system, place responsibility on one source, insure correct wiring, and reduce field labor. Catalog C11 illustrates variety of designs and circuits now in use. — WEBSTER ENGINEERING CO.

211—Butterfly Valves — Folder supplement to Catalog 307 stresses flexibility in valve line for controlling large volumes of liquids or gases. Valve actuators, special arrangements, shaft extensions, and electric actuators and positioners are featured. — MASON-NEILAN.

212—Self-Powered Controls — Bulletin 620 describes self-powered automatic temperature regulators — no compressed air or electrical wiring required, no delicate mechanisms to adjust, no packing glands to stick, no shut-down due to power failure. —SARCO COMPANY, INC.

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Reader Service
SOUTHERN POWER & INDUSTRY
806 Peachtree St., N. E.
Atlanta 8, Ga.

(*Continued from page 84*)

228—Fuel Cut-Outs & Water Level Alarms — Brochure D2 — Electrode type equipment for installation on water columns to provide fuel cut-out, high and low water level alarms and pump cut on and off. For pressures to 2500 psi. — RELIANCE GAUGE COLUMN CO.

235—Liquid Level Gauges — Bulletin 463A describes automatic remote reading systems for nearly any liquid. Features include easy to read dial indication. — LIQUIDOMETER CORP.

244—Desuperheaters — 4 page Bulletin 1024-A describes steam-assist desuperheating. Charts show the close control of temperature which is possible during wide load fluctuations. Schematic diagrams of piping arrangement and control systems. — COPES-VULCAN DIV.

255—Temperature Regulators — "Sliding Gate" units are simple, low cost, self-operating, automatic control valves for heating or cooling applications. Action easily reversed by rotating seats 180°; self-powered — no electricity or compressed air needed; easy to install. Bulletin J-180-1 describes ten standard ranges from 35-450 F.—OPW-JORDAN.

267—Remote Liquid Level Indicators —Bulletin RI-1825 describes indicators for pressures up to 3000 psi — advantages, operation and specific installations. — YARNALL-WARING COMPANY.

281—Diaphragm Control Valves for accurate control of pressure-temperature and liquid level described in Catalog J-170. Designed specifically for instrumented process systems requiring linear flow characteristics and tight shut-off.—OPW-JORDAN.

293—Metering & Control Systems—Bulletin 500, 4 pages, discusses pneumatic and electric telemetering. Covers components making up the systems. — BAILEY METER CO.

PLANT CONSTRUCTION—WELDING EQUIPMENT—SPECIALTIES

300—Buyer's Guide — Up-to-date industrial and maintenance building products stock list. Includes complete listing of all Rasco distributed products plus branch locations. — REYNOLDS ALUMINUM SUPPLY CO.

301—Vacuum Cleaning Systems — How portable and stationary systems cut costs and increase plant efficiency shown in Booklets P8 and AB-100. Eight heavy duty units (1½ to 15 hp) for cleaning hard to get at areas, reclaiming valuable materials. — U. S. HOFFMAN MACH. CORP.

310—Incinerator — Metal cased, insulated, refractory lined incinerators for industrial and commercial use. City smoke code approved. Fast, economical installation — any size and capacity.—NORTH STATE PYROPHYLLITE CO.

314—Plant Heating Units — Infra-Red comfort heating gas-fired units with no moving parts described in Bulletin PC 1-60 G. AGA and UL approved. — PANELBLOC DIV., BETTCHER MFG. CORP.

315—Pressure Vessels — Catalog 100 discusses plate fabrication problems and shows how company custom-fabricates hot water storage heaters, tanks, air receivers, blow-off tanks. Corrosion resistant linings and materials featured. Suggested specifications and other valuable technical data given. — J. J. FINNIGAN CO.

317—Drier Compressed Air—Bulletin 130 shows how Aero After Cooler cools compressed air or gas below temperature of surrounding atmosphere; no further condensation in air lines. Installed outdoors. Saves cooling water. Gives better operation of air-operated tools. — NIAGARA BLOWER COMPANY.

323—Mercury Vapor Fixture — Industrial color corrected units described in Bulletin 401. "Stabilux Socket" secures bulb end of lamp, eliminating lamp rupture and breakage from vibration. — WIDE-LITE CORP.

324—Painting New Plants — "Plan Painting of New Plants to Reduce Costs" describes how company's lead-suboxide paints can save 1 or 2 coats of paint on new plants. Eventual repainting costs are cut as well since these paints form a dense, metallic lead film which can be recoated without expensive scraping, sanding or repriming. — SUBOX INC.

325—Water Storage — The Cylindroid, a functional design for large-volume, low-cost, ground-level water storage described in 4-page catalog. Light steel construction, and smaller field erection crew are among savings over standard ground-level tanks. — GRAVER TANK & MFG. CO.

332—Heat Transfer Equipment — If you have material to liquefy, heat, vaporize, superheat, condense, cool or solidify, check Bulletin HE-8 describing exchangers designed for temperatures as low as minus 160 F and as high as 1600 F with pressures ranging from vacuum to 9500 psi. — HENRY VOGT MACHINE CO.

336—Retaining Walls — Catalog RW 3555 shows how bin-type walls stabilize slopes and gain valuable ground for buildings, parking areas; all metal cellular construction; all-bolted assembly means small crews can do the job.—ARMCO DRAINAGE & METAL PRODUCTS, INC.

355—Steam-Jet Cleaners — Bulletins JC-100 and SG-200 describe steam - jet cleaners. Series "R" Speedylectric generates steam to 250 psig and temperatures to 405 F. Larger cleaners available. — PANTEX MFG. CORP.

357—Mechanical Lubricators — Various force feed mechanical lubricators, accessories, and components available for lubrication systems described in Bulletin L-60.—MANZEL.

365—Storage Water Heaters — Gas-fired, Scalefree 230 units described in Bulletin 4. Fully automatic package requires only simple connections. Available in more than 100 storage and recovery combinations. Storage capacities range from 250-4000 gal. — THE PATERSON-KELLEY CO.

370—Industrial Fence — You can eliminate pilferage, control traffic, and improve plant appearance most economically with Anchor Chain Link Fences. Catalog gives case studies from other plants in South-Southwest. — ANCHOR FENCE.

386—Rigid Frame Buildings—8 page bulletin "Dixisteel Rigid Frame Buildings" — low cost, flexibility of design, durability, and minimum maintenance; also triangular or bowstring truss all-steel roof systems; fabricated for rapid erection.—ATLANTIC STEEL COMPANY.

390—Tank Insulation — An uninsulated tank is like a giant radiator heating the outdoors — and that costs money. 8-page Ultralite Tank Brochure tells you how you can save over 90% of this heat loss with glass fiber blankets. Can pay for itself in six months to a year. — GUSTIN-BACON.

PIPING—VALVES—FITTINGS STEAM SPECIALTIES—TRAPS

402—Forged Steel Valves—General Purpose Valves, Supplement No. 1 to Catalog F-9, covers gate, globe and angle valves, ¼" through 2" sizes, for 150-800 pound service. Featuring 13% chrome stainless steel trim with hard facings. — HENRY VOGT MACHINE CO.

403—Valve Operators—Folder shows how re-designed sprocket rim makes any valve readily accessible from the floor. Simplifies pipe layouts, prevents accidents, fits all valve wheels. — BABBITT STEAM SPECIALTY CO.

407—Piping Materials—Bulletin reports on intensive investigation into problem of main steam piping materials and gives data on stress rupture characteristics of Types 316 and 347 stainless steel piping adjacent to welded joints. — PITTSBURGH PIPING AND EQUIPMENT COMPANY.

409—Lubricated Plug Valves—Catalog PV-4 covers operational features. Quarter-turn to open or close; lubricant grooves provide positive seal when valve is closed; when open, seating surfaces not exposed. —THE WM. POWELL COMPANY.

410—Flexible Connectors—How all-metal connectors absorb piping vibration described in Catalog 1D-100C. Convey corrosives, simplify misaligned hookups, and save installation time. Bronze, carbon steel and stainless steel.—UNIVERSAL METAL HOSE CO.

Bulletins (Cont.)

411—Steam Trap Book — 48 page manual reviews importance of good trapping. Gives complete data on traps and strainers. Contains complete selection, installation, testing and maintenance information. Many useful tables and charts. — ARMSTRONG MACHINE WORKS.

414—Acid Resistant Pipe — 4 page technical brochure covers properties of Union 20-S stainless steel. Alloy can be welded and put into service without subsequent annealing. Shows comparative resistance to 94 different corrosive agents. — REYNOLDS ALUMINUM SUPPLY CO. — UNION STEEL CORP.

425—Steam Trap with only three parts — cap, disc and body described in Bulletin 257. No valve closing mechanisms. Only moving part is solid stainless steel disc. Same trap for all loads and pressure 10-600 psi. — SARCO COMPANY, INC.

429—Expansion Joints — Advantages of the Gun-Pakt expansion joint described in Bulletin EJ-1917. No shutdowns for repacking. Installational suggestions. — YARNALL-WARING COMPANY.

443—PVC Fittings & Flanges — Corrosion resistant polyvinyl chloride pipe fittings and flanges covered in 12 page catalog, featuring characteristics, advantages, limitations, operating pressures, temperatures and field tests.—GRINNELL COMPANY, INC.

452—Pipe and Tubes—42 page Bulletin 26 gives types of steel tubes, tensile, creep and rupture properties, welding and forming data, applications and other valuable information. — National Tube Div., UNITED STATES STEEL CORP.

458—Stainless Valves—Catalog gives complete technical data on stainless steel valves for all purposes. Over 100 valves diagrammed and described.—REYNOLDS ALUMINUM SUPPLY CO. — COOPER ALLOY CORP.

463—Stainless Steel Valves — Catalog 59 SS describes complete line of gate, globe and swing check valves with full details of valve patterns in alloys that satisfy requirements of most corrosive services. Includes section to show degree of resistance of alloys to many corrosive media under varying conditions. — JENKINS BROS.

488—Power Piping Field Erection — Increased importance of piping erection proficiency is stressed in new 12-page brochure. Tells how field erection costs and quality are controlled and discusses welding and other technical aspects. — THE M. W. KELLOGG COMPANY.

493—Unions & Swing Check Valves — Engineering data, sizes, weights and dimensions on Perfect Seal Pipe Unions and Swing Check Valves featured in 20-p Catalog 60. Also features Gasketless Cup-Orifice Unions and Ductile Iron Check Valves. — CATAWISSA VALVE & FITTINGS CO.

BOILERS—STOKERS TURBINES—BURNERS

502—Feedwater Treatment — 4 page catalog tells how Braxon and Flako internally condition water to remove and prevent scale formation and corrosion in boilers. — ANDERSON CHEMICAL COMPANY.

509—Free Coal Counseling — General information on how Coal Bureau engineers will advise on selection, transportation and utilization of the right coal for your purpose.—NORFOLK AND WESTERN RAILWAY.

510—Vibra-Grate Stoker — Water-cooled vibrating grate stoker in sizes from 25,000 to 150,000 lb of steam per hour; no dust collector required and assures freedom from smoke, even at low ratings; easily adapted for burning gas or oil in combination with coal, or singly; requires minimum maintenance. — AMERICAN ENGINEERING CO.

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See Pages 85 & 86

515—Packaged Steam Generators — Bulletin PSG-2 describes factory assembled portable type units from 10,000 lb/hr to 40,000 lb/hr capacities. Gives construction details and dimensions. In standard pressures of 175,250 and 375 psi gauge. — HENRY VOGT MACHINE CO.

516—Small Boiler Performance — 4 page bulletin shows how the packaged Ljungstrom air preheater boosts performance. Boilers as small as 25,000 lb/hr can have advantages of regenerative preheating — saves fuel, boosts output, and permits use of lower grade fuels. — THE AIR PREHEATER CORPORATION.

521—Gas Tempering — How you can burn the most economical fuel available (coal, oil or gas) described in Bul. G-96. Cuts overall plant costs since smaller size unit requires smaller building per kw. — THE BABCOCK & WILCOX CO.

523—Soot Blowers—Bulletin 1030 describes Vulcan T-30 retractable soot blowers, available in lengths up to 38 ft. Includes sectional drawings and special design features. — COPES-VULCAN DIVISION.

527—Pneumatic Spreader Stoker — Bulletin shows how unit combines coal drying, metering, conveying, uniform burning and cinder return in one efficient system. — IRON FIREMAN MFG. CO.

532——Economical Steam — Forced draft, pressurized gas or oil fired units described in SB-59 catalog. Two-drum water tube units include steam trim, draft equipment, burner and combustion safety controls. — ERIE CITY IRON WORKS.

535—Unit Steam Boilers — Catalog AD-100 — Gives complete information on oil and gas fired "Self Contained" boilers, 15 to 500 hp, 15 to 250 psi for processing and for heating. Gives features, applications, efficiencies, capacities and dimensions.—CLEAVER-BROOKS CO.

536—Automatic Boiler-Burner Unit —Assembled plant (Scotch-type, two-pass) for all heat or power applications; for low pressure or high pressure use; burner to match for heavy oil, light oil, or combinations of gas/light or gas/heavy oil. Easy maintenance. Bulletin SPI-100 gives details. — INDUSTRIAL COMBUSTION, INC.

539—Industrial Burners — How to keep heating costs low with Hev-E-Oil commercial-industrial burners described in bulletin SPI-859. Models from 5 to 150 gph; automatic, electronic controls; Hev-E-Duty power gas burners and combination gas/oil burners from 720,000 to 21,000,000 Btu. — INDUSTRIAL COMBUSTION, INC.

549—Firing Systems — Folder No. 5843 describes industrial packaged forced-draft firing systems for dual-fuel or single-fuel firing of high or low pressure natural, LP or manufactured gas or any grade of oil from No. 2 through No. 6 in Scotch marine, steel firebox, water tube or cast iron boilers. — IRON FIREMAN MFG. CO.

551—Packaged Water Tube Boilers — Complete data and dimensions for boilers ranging from 8000 to 50,000 lb/hr, firing oil or gas or both, described in 12 page Catalog 111-D. — SUPERIOR COMBUSTION INDUSTRIES, INC.

557—Coal — Current brochure on "Prescription Coals." — A. T. MASSEY COAL CO., INC.

563—Burn Refuse Fuels — Bulletin 510 describes and illustrates spreader stokers for utilizing many refuse and by-product waste materials as fuel to produce steam for process, power or heating. — DETROIT STOKER COMPANY.

569—Pressure Atomizing Oil Burner — The new Type C-45 burner for use with economical heavy commercial No. 4 and No. 5 fuel oils described in Bulletin 100. — NATIONAL AIROIL BURNER COMPANY, INC.

570—Seamless Boiler Tubes — 44 page Bulletin 12 contains complete description of manufacture, advantages, tolerances, allowable stress and working pressures, bursting strength, weights, steam properties and other data.—NATIONAL TUBE DIV., UNITED STATES STEEL CORP.

574—Packaged Generator—Bulletin 582 describes Vapormatic Coil-N-Shell Steam Generator for service requirements of 5 to 150 psig. Gives operation features and specification data. Available with gas, oil, and combination gas/oil fuel systems. — TEXSTEAM CORP.

590—Packaged Rotary Burner—Fully automatic Roto-Pack forced draft units described in Bulletin; 6 sizes, 7 types to fit all automatically fired boilers or furnaces. Burn all grades of fuel oils, gaseous fuels or combination of both — TODD SHIPYARDS CORPORATION.

ENGINES—DRIVES POWER TRANSMISSION MATERIAL HANDLING

600—Mechanical Shaft Seals—Chempro mechanical external seal described in Bulletin CP-551. First seal designed for complete interchangeability with packing. No mounting clamps, machinery stuffing box faces or drilling holes. Install in 30 min. Adjust after installation.—CHEMICAL & POWER PRODUCTS, INC.

606—Retaining Ring Kits—400 Truarc cadmium plated rings — 84 sizes in one economy kit. Sizes from ¼ to 2½ in. in three most used series of internal, external and universal crescent ring designs — $34.50 per kit. — DIXIE BEARINGS, INC.

607—Crane Systems — Booklet 2008, profusely illustrated, shows how Tramrail transfer cranes can systematize handling; engineering and application data. — CLEVELAND TRAMRAIL DIV.

610—Flexible Couplings — Catalog 60 describes couplings for maintenance-free power transmission — no lubrication, and no wearing parts. Recommended basic coupling arrangements and load classifications are featured.—THOMAS FLEXIBLE COUPLING COMPANY.

614—Vertical Transportation — Catalog A-382 describes and illustrates details of passenger and freight elevators and escalators, for use in all types of industrial plants. — OTIS ELEVATOR CO.

615—Dial Scales — Catalog gives specifications on dozens of standard and special types for industry. Accessories for printed weight records and remote weight indications. — THE HOWE SCALE CO.

628—General Purpose Trucks — Catalog T-54 describes two wheel hand trucks and platform — a full line manufactured in Rome, Ga. plant to cover your material handling needs. — THE FAIRBANKS CO.

635—Bearings & Bars — Pocket size edition 158 gives complete list of cast bronze and sintered bronze bearings and bars. Bearing aluminum bar data included. — THE BUNTING BRASS AND BRONZE COMPANY.

641—Belt Conveyors — Cat. ID-591, 88 pages, shows principal belt conveyor products, including heavy duty and standard roller bearing and precision ball bearing idlers. Comprehensive Engineering Data section contains simplified and condensed information for proper selection. — CONTINENTAL CONVEYOR & EQUIPMENT CO.

WATER TREATMENT—HEATING & AIR CONDITIONING—DUST & FUME CONTROL—REFRIGERATION

703—Air Conditioning—Bulletin 122 describes and illustrates operation and suggests applications for air conditioning method that controls humidity to 1% rh and temperature to 1 F (up to 140 F) with accuracy, independent of moisture sensitive instruments. — NIAGARA BLOWER CO.

705—Test Your Tower—Bulletin offers simple, proven method by which you can determine how closely your actual tower performance measures up to specified performance. Particularly applicable to operations geared to temperature of process cooling water. — THE MARLEY COMPANY.

708—Zeolite Softener — Bulletin 4530-A, 8 pages, discusses the hydrogen zeolite process—its advantages, chemistry and neutralizing variations. — COCHRANE CORP.

712—Ion Exchange — Bulletins discuss Two-Bed De-Ionizers and Mixed-Bed De-Ionizers, with photos to illustrate plant applications and diagrams to show operation.—ILLINOIS WATER TREATMENT COMPANY.

713—Electric Precipitators—26 page Bulletin 104 shows how units meet five engineering requirements —Positive control of gas flow; high, uniform electrode emission; effective continuous cycle rapping; and safe, trouble-free high voltage equipment. Gives 9 time-tested steps to a successful installation. — BUELL ENGINEERING COMPANY, INC.

715—Amine Treatment—Return line corrosion is a critical problem in maintaining economical, efficient power plant operation. Bulletin CP-100 shows how amine treatment is an easy, effective and economical way to eliminate pipe corrosion problems. — THE BIRD ARCHER COMPANY.

716—Dust Collection—Whether nuisance elimination or process material recovery, check on Whirlex Dust Collector Units. Engineering data available. — THE FLY ASH ARRESTOR CORP.

719—No Frost Refrigeration — Bulletin 105 describes with diagrams and photographs method used for food freezing, chilling and warehouse refrigeration on largest scale without frost or ice formation, insuring full capacity and uniform temperature.—NIAGARA BLOWER CO.

(*Continued on page 90*)

DON'T OVERLOOK

STEAM SPECIALTIES

If you believe that it's often the little things that count, you will pay attention to such items as steam specialties. Often used in large volume, their performance can contribute substantially to profit or loss in your company's operations.

You will see at the Power Show such steam specialties as steam traps, strainers and separators, steam cleaners, controllers and regulators, temperature and pressure instruments, indicating and recording devices, as well as a complete range of power and allied equipment ready for your inspection.

Here is your opportunity to investigate, compare, and get the right answers, face-to-face, from the manufacturers themselves. Only at the Power Show can you see over 250 leading suppliers' products, all conveniently grouped together.

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2524

24th NATIONAL EXPOSITION OF POWER & MECHANICAL ENGINEERING

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NEW YORK COLISEUM

NOV. 28—DEC. 2, 1960

MANAGEMENT: INTERNATIONAL EXPOSITION COMPANY
480 Lexington Ave., New York 17, N. Y.

Bulletins (Cont.)

720—Power Roof Ventilator—4 page Bulletin 550 illustrates and describes Centrilator, the centrifugal power roof ventilator with the exclusive "jet siphon." Includes capacity and dimension tables. — CLARAGE FAN CO.

751—Chemical Service—Water conditioning products, equipment and services highlighted in literature — boiler feedwater treatment, cooling water treatment, corrosion inhibitors, fuel oil additives, coagulants, cation resin cleaners. — Chemical Service Dept., THE PERMUTIT COMPANY.

756—Refrigeration Problems?—VMC compressors, intercoolers, chillers, described in Bulletin 817 — design improvements, protective devices and factory-run-in-tests.—THE VILTER MANUFACTURING COMPANY.

764—Cooling Equipment — Bulletin 80-D describes company's complete line of commercial and industrial equipment — operating principles, design features. — FRICK CO.

ELECTRICAL

807—Motor Bearings — Catalog 258 gives complete listing of cast bronze motor bearings for all makes and sizes. — THE BUNTING BRASS AND BRONZE COMPANY.

809—Capacitor Selection Guide — 6 page Folder GED-3687 gives tables for choosing proper ratings of switched shunt capacitors for modern induction motors. Covers motors of all standard types, enclosures, and nominal speeds, 220-4000 v, 2-500 hp. — GENERAL ELECTRIC CO.

813—600-Volt Wiring — How Anaconda Densheath 900 offers long life, high heat and moisture resistance, chemical stability and easy installation is described in Bulletin DM-5612 — ANACONDA WIRE & CABLE CORP.

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816—High Voltage Protection — 36 page catalog of linemen's protective equipment describes products for utility and industrial electrical fields. — CHARLESTON RUBBER COMPANY.

820—Electrical Maintenance — New contract service (for Southeast only) inspects and tests motors, generators, gearing, control and distribution systems, at a cost less than 1% of value of equipment.—Atlanta Office of WESTINGHOUSE ELECTRIC.

855—Wiring Analyzer — 4 page bulletin describes Model 301 Adequate Wiring Analyzer which quickly, simply and easily tests wiring without confusing calculators or slide rules.—SPRAGUE ELECTRIC COMPANY.

871—Electrical Protection — Handbook tells how to select protective devices for circuits, motors and apparatus. Condenses all '59 Code references covering protection problems. Explains how installation costs can be cut and space saved with Dual-Element fuses. — BUSSMANN MFG. DIV.

Late Bulletins

L-1—Incinerator Stoker — Bulletin 701, 4 pages, introduces a new type reciprocating grate incinerator stoker for destruction of industrial garbage and refuse, with greater flexibility of operation and less attendant labor.—DETROIT STOKER COMPANY, Monroe, Mich.

L-2—Belt Lacing Equipment—Folder No. 100, pocket-size, contains descriptions and prices of belt hooks, lacers, and cutters, with pictures of each model. Includes conveyor-corrugator belt lacer and six- and ten-inch belt cutters. — CLIPPER BELT LACER CO., Grand Rapids 2, Mich.

L-3—Bus Duct — Application Data 30-664, 12 pages, covers electric utility bus duct. Descriptions, drawings, dimensions, specifications, engineering and test data give specific information for lay-out and installation. — WESTINGHOUSE ELECTRIC CORP., Box 2099, Pittsburgh 30, Pa.

L-4—Chemical Feed Systems — Bulletin CS-107, 4 pages, illustrates standard, compact packaged chemical feed systems for accurate control of reagent chemicals to be added to boiler feedwater. Shows diagram of typical installation. — IONAC CHEMICAL COMPANY, Div. of Pfaudler Permutit Inc., Birmingham, New Jersey.

L-5—Automatic Coal Scale — Tech. Ref. Bul. No. 0359, 7 pages, illustrates and describes design of new Model H-39C automatic coal scale. Explains each of the 25 features, and includes three-dimensional drawing. —RICHARDSON SCALE CO., Clifton, N. J.

L-6—Pipe & Block Insulation — Form 6472, 6 pages, lists pertinent data concerning industrial insulation for temperatures up to 1350 F — calcium silicate pipe and block insulation. Covers efficiency, handling, high impact strength, flame and water resistance, and other details. — PHILIP CAREY MFG. CO., 320 S. Wayne Ave., Cincinnati 15, Ohio.

L-7—Heat Exchangers — Bulletin 111, 8 pages, explains design and application of new line of multi-

Boiler Tube Service

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McKEES ROCKS, PA. (Pittsburgh District) Federal 1-7750

tube, double pipe heat exchangers suited for many high capacity applications — for light fluids as well as conventional uses. — BROWN FINTUBE CO., 300 Huron St., Elyria, Ohio.

L-8—Pressure Instruments — Bulletin 40, 2 pages, covers measuring mechanisms, indicators, recorders, and transmitting devices. Illustrated with photographs and line drawings. — BAILEY METER COMPANY, 1050 Ivanhoe Road, Cleveland 10, Ohio.

L-9—Flexible Valves — Bulletin FL 1217A, 4 pages, gives answers for handling the flow of corrosive and abrasive materials, as well as other tough valve problems. Case histories show specific installations. — FARRIS FLEXIBLE VALVE CORP., 405 Commercial Ave., Palisades Park, N. J.

L-10—Liquid Level Controls — Catalog Section 4A, 12 pages, describes displacement type liquid level controls for actuating pumps, valves, high and low level alarms in a variety of applications. Installation dimensions are included. — MAGNETROL, INC., 2110 S. Marshall Blvd., Chicago 23, Ill.

L-11—Chemical Processing — Bulletin G-3D, 12 pages, discusses applications and performance characteristics of pumps, conveyors, compressors, coolers, preheaters, and other equipment for the chemical processing industries. — FULLER COMPANY, Catasauqua, Pa.

L-12—Tape Analyzer — Bulletin WC-127, 4 pages, covers new automatic tape analyzer, including the "Millipore" filter tape used as the testing medium. Principle of operation, applications, and specifications are given. — GRAVER WATER CONDITIONING CO., 216 West 14th St., New York 11, N. Y.

L-13—Turbine Supervisory Instruments—Bulletin 3078-1, 12 pages, describes compact redesign of a TSI system that charts a permanent record of mechanical performance throughout starting and running periods. — GENERAL ELECTRIC COMPANY, Schenectady 5, N. Y.

L-14—Coatings — Bulletin P-57, 4 pages, catalogs "Minimum-Interruption Maintenance" coatings designed primarily for the food, chemical, and paper industries, but having other industrial applications. — WILBUR & WILLIAMS COMPANY, 650 Pleasant St., Norwood, Mass.

L-15—Bulk Handling — Catalog E, 28 pages, describes and illustrates "DragScraper" storage and reclamation for handling chemicals, ores, sand and other bulk materials. Buckets, blocks, hoists and other components of the machines are covered. — SAUERMAN BROS., INC., Dept. S-10, 620 S. 28th Ave., Bellwood, Ill.

L-16—Vibration Control — Booklet K4G, 8 pages, gives engineering specifications and performance data for 27 types of products for control and measurement of machinery vibration, shock and noise. Installation photographs show equipment and solution to typical problems. — THE KORFUND COMPANY, INC., 48H Cantiague Road, Westbury, L. I., New York.

L-17—Speed Reducers — Book 2719, 36 pages, "Parallel Shaft Speed Reducers," describes redesigned and expanded line of reducers in 57 sizes, including single, double and triple units with capacities up to 2800 hp. — LINK-BELT COMPANY, Dept. PR, Prudential Plaza, Chicago 1, Ill.

L-18—Dust Control — Bulletin No. 271, 12 pages, discusses four types of dust control products: dry centrifugals, wet collectors, fabric collectors, and electrostatic precipitators. — AMERICAN AIR FILTER COMPANY, INC., Dept. PD, 215 Central Ave., Louisville 8, Ky.

L-19—Balancing Valve — Bulletin No. 204, 4 pages, describes a dual-purpose hot water balancing valve, designed to take the place of two valves normally used in series on the return line of a water coil, thereby effecting economies in installation. — AMERICAN AIR FILTER COMPANY, INC., Dept. PD, 215 Central Ave., Louisville 8, Ky.

L-20—Draft Fans — Bulletin RT-100, 6 pages, contains information on high volume radial tip mechanical draft fans, with charts, tables, and list of optional and auxiliary equipment.—CHICAGO BLOWER CORP., 9867 Pacific Ave., Franklin Park, Ill.

L-21—Silicones — Bulletin No. 1-115, 16 pages, is an Engineering Guide to the forms, properties and applications of Dow Corning silicones, materials of design and production that resist time, heat, cold, moisture, weathering, oxidation, electricity and chemical attack. — DOW CORNING CORPORATION, Midland, Mich.

L-22—Industrial Water Services — Brochure 410-12-30, 22 pages, describes the role of industrial water consulting service, discusses the whole range of industrial water problems, and highlights the necessity for proper water management to obtain lowest water costs. — HALL LABORATORIES, Division of Hagan Chemicals & Controls, Inc., Hagan Center, Pittsburgh 30, Pa.

L-23—Vibrating Conveyors—Catalog 954, 60 pages, covers mechanical vibrating conveyors designed to meet a full range of applications in a variety of industries. Illustrated with photographs and dimensional drawings. — THE JEFFREY MANUFACTURING CO.

L-24—Air Chain Conveyors — Brochure, 6 pages, explains how it is possible to load or unload a 32-ft trailer of palletized material in minutes with an Alvey air chain conveyor system. — ALVEY CONVEYOR MANUFACTURING CO.

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WATER TREATMENT!

Is good boiler housekeeping in your plant beset by sludge, scale and corrosion? Are these enemies of efficiency increasing downtime and maintenance costs, fighting company profits and your own career?

The Power Show can help you find better ways to fight back. It can help you keep your company's profits growing and your own job on the upgrade by keeping you up-to-date on water softeners, demineralizers, dealkilizers, filters, deaerating heaters and clarifiers — PLUS a broad line of other power and allied equipment.

Only at the Power Show do you have the opportunity to investigate, compare and get the right answers, face-to-face, from the manufacturers themselves. Only at the Power Show can you see over 250 leading suppliers' products, all conveniently grouped together at one time.

Make sure you're there. Everyone else will be!

2449

24th NATIONAL EXPOSITION OF POWER & MECHANICAL ENGINEERING

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NEW YORK COLISEUM

NOV. 28—DEC. 2, 1960

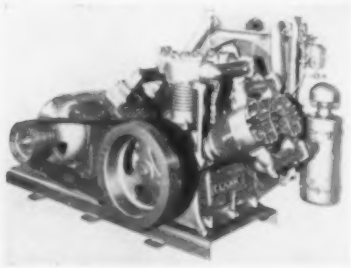
MANAGEMENT: INTERNATIONAL EXPOSITION COMPANY
480 Lexington Ave., New York 17, N. Y.

New Products

(Continued from page 83)

Air Compressors

W-12 A new line of 100 lb air compressors in the 25-100 hp range has been introduced by **Clark Bros. Co.**, Olean, New York, one of the Dresser Industries.

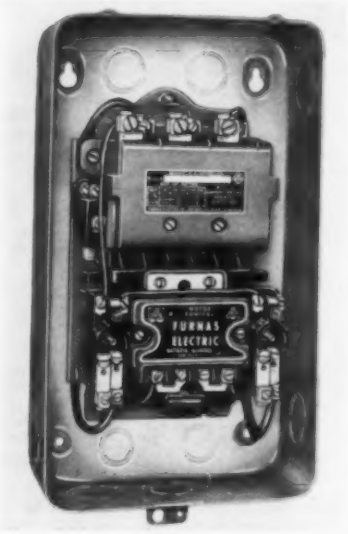


Designated the C-Line, these two stage, air cooled units are designed for compactness, durability and high efficiency. Complete air cooling eliminates the need for cooling water jacketing.

Two stage compression, intercooling between stages, generous valve areas, large air passages and good mechanical efficiency produce substantial savings in power consumption. Compressor cylinders operate at very conservative piston speeds to assure optimum efficiency and long life. Of the single acting type, both high and low pressure cylinders are cast of iron alloy and individually removable. The outer surface is finned in proportion to heat removal duty. Only four cylinder sizes cover the complete line of compressors, thereby permitting unusual interchangeability of parts and minimizing replacement inventories.

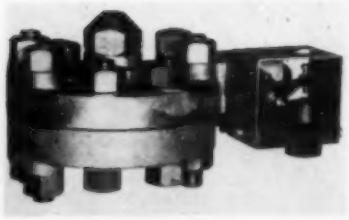
Magnetic Motor Starters

W-13 **Furnas Electric Company**, 1047 McKee St., Batavia, Ill. announces a new concept in motor control design through 30 hp 550 volts, which offers unitized construction with all components front removable.



Features include plug-in type push buttons or selector switches, easily added in the field. Thermal overload relays with trip indicator are trip-free and tamper-proof. Third overload can be added without changing enclosure. Magnet coils are molded type dual voltage (110/220 or 220/440) dual cycle (50-60). Coil has molded terminal board, eliminating leads. Up to 3 auxiliary interlocks for pilot duty may be added.

Other features include low wattage magnet, silver-cadmium oxide contacts, pressure terminals, fungus resistant coil, and small mounting area.



Pilot Valve

W-14 Variable system pressures do not affect the function of a new differential-level pilot valve announced by **Besler Corporation**, 4053 Harlan St., Emeryville, Oakland 8, Calif. The valve operates on the difference between two columns of liquid, usually between a constant reference head and a variable head.

As the level rises in the variable column, the valve opens and releases air pressure from the top of a diaphragm motor valve, allowing the discharge of liquid. When the level in the variable column falls to a pre-determined level the valve again closes, and the cycle repeats. The principle can also be utilized with a steam trap to operate over an extremely wide range of pressures.

Pourable Cement

W-15 **The Monroe Company, Inc.**, Cleveland, Ohio, has developed a new pourable cement called "Evr-Tite," a finely divided powder, containing expansion controlling, water-erosion resistant additives.

Among its many uses are positioning and setting of anchor bolts, fastening pipe flanges, conveyors, furnaces, and machinery bases.

The cement anchoring compound has no shrinkage while setting. It bonds readily to existing materials and withstands maximum impact,

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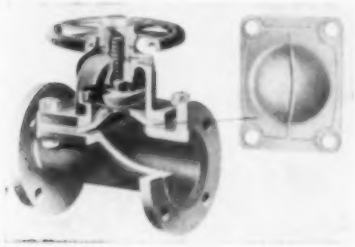
compression, tensile and sheer strengths. It is odorless, vibration resistant and self-leveling. It has a high degree of workability on application and a fast setting capacity, resulting in an extremely hard surface.

Teflon-Faced Diaphragms

W-16 **Hills-McCanna Company,** 4600 W. Touhy Ave., Chicago 46, Ill., announces that one-piece, reinforced elastomeric diaphragms with a permanently bonded



Teflon face now are available for its 4" and 6" diaphragm valves. This type of diaphragm previously was available for ½" through 3" valve sizes.

Chemical resistance and wear life of Teflon-faced diaphragms are said to be equivalent to that of solid Teflon diaphragms, but the price is 25 to 50% lower, depending upon size. Additionally, the resilience of the elastomeric backing of the Teflon-faced diaphragms is claimed to insure tight seating even against solid particles in the line and to provide capacity to absorb considerable shock without rupture.

Teflon-faced diaphragms may be used at service temperatures of —10 F to 240 F continuously, and for short periods of time in temperature ranges up to 280 F. Pressures allowable are consistent with the valve rating, normally 150 psi.

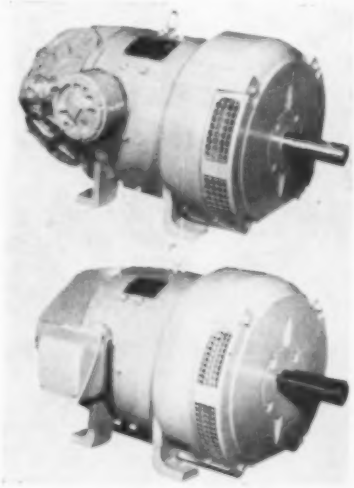
Cleaning Compound

W-17 A cleaning compound so versatile that it can be used for everything from a floor cleaning agent to a general steam cleaner compound is announced by **Lubrication Engineers, Inc.,** 2809 Race St., Fort Worth, Texas.

Whether used as a steam cleaner, hot tank cleaner or as a general cleaning agent, the product—LE#18 Multi-Purpose Cleaner Compound—offers six definite advantages. It is safe for personnel to use and handle; completely fire proof; removes stubborn grime; effective in both soft and hard water; and it rinses freely, leaving no scum or film. The compound is highly resistant to formation of scale deposits in steam cleaning equipment, an important point, as the main difficulty encountered on steam cleaning equipment is that of accumulated scale deposits which clog equipment. But where scale is formed, it is generally loosely adherent and easily removed with the flow of cleaner solution through the steam cleaning unit.

Totally Enclosed D-C Motors and Generators

W-18 New totally enclosed d-c motors and generators designed for both constant speed drives and drives involving fast, wide speed changes and reversals, automatic control, or close regulation are available from the **Westinghouse Electric Corporation,** Pittsburgh 30, Pa.

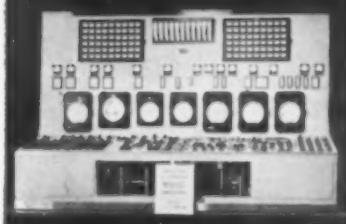


The line includes totally enclosed fan-cooled and totally enclosed nonventilated machines in both industrial and explosion-proof construction. The motors are rated from ½ to 60 hp at 300 to 3500 rpm. The generators are rated from ¾ to 40 kw at 850 to 3450 rpm.

Two major departures from conventional design are: (1) the use of a high-temperature silicone insulation system for machines rated and built for continuous operation with a temperature rise of only 75 C (NEMA's new Class B standard for totally enclosed machines); and (2) application of a new high-capacity system of controlled ventilation in which blowers and heat exchanger are mounted at the shaft end.

WHAT COMES UNDER

ENERGY CONTROL?



On paper it's just a phrase, but at work with you and your company it's important. Everything from fuel savings to calculating nuclear fuel costs comes under the heading of "energy control"—a subject of profit to you and your company.

Constant changes in the field make it imperative that you see such exhibits at the Power Show as temperature controllers, pressure and draft controls, liquid heat controllers and many others —PLUS a broad line of other power and allied equipment.

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NOV. 28—DEC. 2, 1960

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JENKINS PRACTICAL PIPING LAYOUT

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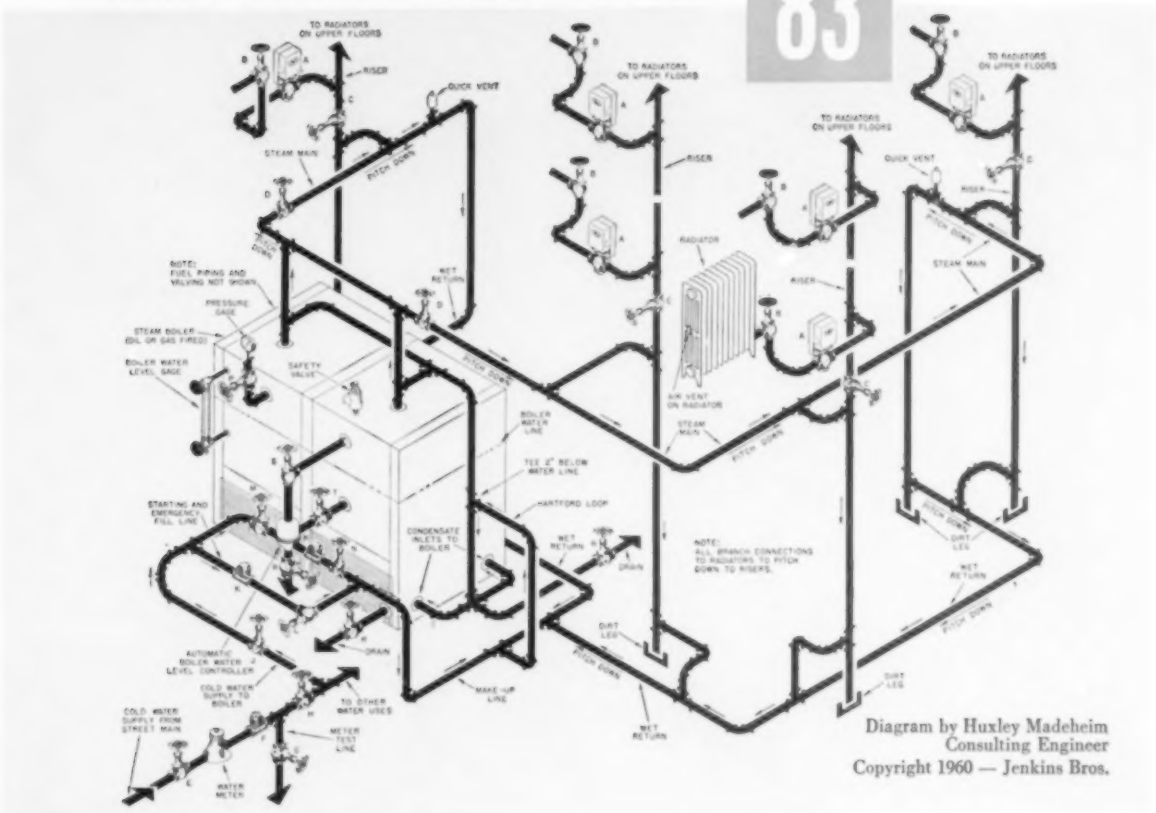

Diagram by Huxley Madeheim
Consulting Engineer
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ONE-PIPE HEATING SYSTEM WITH INDIVIDUAL THERMOSTATIC CONTROL OF EACH AREA

Because of low installation, operation and maintenance costs, this one-pipe system is popular for multi-story buildings where radiators are placed one above the other in line on various floors. It requires no traps, pumps, expansion or balance tanks or special fittings, and its simplicity avoids danger of freeze-up or water leaks. Thermostatic control of the fuel burner and elimination of dependence upon manually-controlled radiators remove principal objections to the conventional one-pipe system . . . the time delay in starting from a cold boiler, uneven heating due to this delay, and insufficient pressure to assure steam in furthermost radiators.

The burner in the boiler of this system operates responsive to an outdoor thermostat which starts or cuts off the burner whenever outside temperature changes from a predetermined value. The burner is also controlled by a pressurestat which cuts off burner at a predetermined value such as 8 psi, and starts it at a lower limit such as 4 psi. The burner can also be controlled by a program clock.

Each individual radiator or area is controlled by a motor operated globe valve of the type made by New England Gear Works, Southington, Connecticut. Each of the valves opens or closes responsive to a thermostat located in the area served by the radiator. The combination of outdoor and area thermostats assures steam in the system and even heat at all times in all areas. A manually-operated radiator angle valve permits shut-off of each radiator whenever desired. A gate valve at bottom of each riser allows access to motor operated valves on that line.

Conventional steam boiler piping and controls are used, with an automatic boiler water level controller, fitted with a manually operated by-pass.

Jenkins Fig. 47-U Standard Bronze Gate Valve, in this layout has design features which assure excellent performance in steam heating service. A solid bronze wedge affords maximum resistance to pressure strains of rapidly vibrating steam. A rising spindle and wheel indicates wedge position, and the backseating bevel on shoulder of spindle permits the valve to be repacked under pressure when wide open.

To assure efficiency in the job when planning any major piping installation, consult with accredited piping engineers and contractors, and select your valves from the Jenkins Catalog.

Enlarged diagram and full description of this layout No. 83 free on request to Jenkins Bros., 100 Park Avenue, New York 17.

CODE	QUAN.	VALVES RECOMMENDED	SERVICE
A	6	Motor Operated Globe made by New England Gear Works	Automatic Steam Control
B	6*	Fig. 168, Bronze Radiator Angle	Manual Control Steam to Radiators
C	4**	Fig. 47-U, Bronze Gate	Individual Riser Shutoff
D	2	Fig. 47-U, Bronze Gate	Boiler Mains Shutoff
E	1	Fig. 47-U, Bronze Gate	City Water Supply Shutoff
F	1	Fig. 92-A, Bronze Swing Check	Prevent Backflow into City Water Main
G	1	Fig. 106-A, Bronze Globe	Meter Test Flow Control
H	1	Fig. 47-U, Bronze Gate	Building from Meter Shutoff
J	1	Fig. 47-U, Bronze Gate	City Water Make-up to Boiler Shutoff
K	2	Fig. 92-A, Bronze Check	Prevent Backflow from Boiler to City Water
L	1	Fig. 108-A, Bronze Angle	Manual Control Water to Boiler
M	1	Fig. 106-A, Bronze Globe	Control Automatic Boiler Water Level Controller
N	1	Fig. 47-U, Bronze Gate	Shutoff Automatic Boiler Water Level Controller
P	1	Fig. 743-G, Bronze Needle	Steam to Pressure Gage Control
R	3	Fig. 108-A, Bronze Angle	Control Drainage from Boiler and Equipment
S	1	Fig. 108-A, Bronze Angle	Shutoff Automatic Boiler Water Level Controller from Boiler
T	1	Fig. 106-A, Bronze Globe	Shutoff Automatic Boiler Water Level Controller from Boiler

*One for each Radiator **One for each Riser

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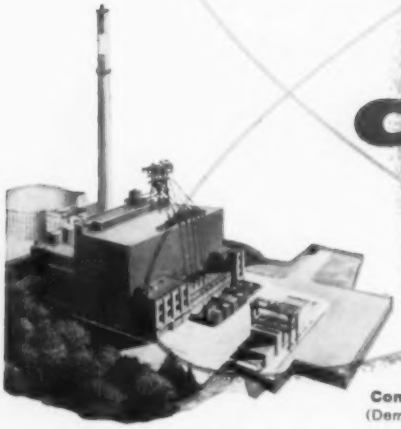

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An indication of Cochrane's contribution to nuclear power development is given by the following list of projects undertaken since 1953:

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1 Deaerator

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1 Zeolite Softener
1 Acid Feed
1 Decarbonator

Nuclear Aircraft Development
2 Demineralizers

Nuclear Ship Propulsion
2 Demineralizers

Pressurized Reactor Tests
3 Demineralizers

Nuclear Ship Fleet Escort
2 Demineralizers

Nuclear Test
1 Vacuum Deaerator

Nuclear Ship Reactor Prototype
1 Deaerator

Nuclear Ship Fleet Escort
2 Deaerators

Nuclear Test Work
1 Vacuum Deaerator

Nuclear Tests
1 Vacuum Deaerator

Nuclear Aircraft Carrier
4 Marine Deaerators

Nuclear Destroyer
1 Marine Deaerator

Nuclear Destroyer
2 Marine Deaerators

4 Public Utilities
Demineralization Plants

Nuclear Research in Italy
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2 Zeolite Softeners

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Nuclear Submarine Tender
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